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Color Micro Journal™

The Color Computer Monthly Magazine

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THIS 'N THAT

CoCo 2 Disk Controller

When we made our "First Look" Report on the new Radio Shack **Color Computer 2** last month, we discussed the fact that it has no +12 Volt DC Line, which would cause problems with the Disk Controllers, because they require the +12 Volts for the "Write Pulse Width" reference voltage and as a power source for the WD1793 Controller Chip. The information we had at that time indicated that a 5 Volt Disk Controller would not be available, so we speculated that the normal procedure would be to use a Radio Shack **Multi-Pak** for the Disk Controller with the Color Computer 2.

We are happy to say that there **WILL** be a **5 Volt ONLY Disk Controller** available shortly; in fact, as soon as the 'in stock' Controllers are gone, that is the only one that will be sold by Radio Shack (it will work with ANY of the Color Computer Series, because they **ALL** have at least the +5 Volt Line going to the Cartridge Slot). Our information is that the 5 Volt Controllers will be in the 'off-white' cases that match the Color Computers now being sold. So, OFFICIALLY, there **WILL** be a Disk Controller from Radio Shack for the CoCo 2's.

While on the subject of Disk Controllers for the Color Computers, we have seen a few 'third party' units advertised, but have only seen one, so far, to report on. That is the **RDC-1** from **F & D Associates, 1210 Todd Road, New Plymouth, OH 45654.** F & D has been supporting the SS-50 Bus community with PC Boards and, in a few cases, Kits, for a few years, and have

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LINKING LOADER

for both
RS DOS and RS FLEX

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INTRODUCTION

The scope of this article is to discuss programming in Assembly Language (or any language) using program modules, alternate ways of using program modules, and a description and listing of a Loader and a Linking Program.

There are at least three reasons for breaking a large program up into smaller modules. Small modules are easier to understand than a long program. It is usually easier and faster to break any complicated project up into smaller, simpler projects. You will save memory by putting repeated code into a subroutine. General purpose routines can be put into a library and used by many programs. You won't have to rewrite the routine for every new program.

There are a number of ways to use subroutines. BASIC programmers often have to include the code in the program. You can do that for other languages as well. This is OK for subroutines that are specific to the application, and all the source code is in one place for examination. However, if there are many subroutines, the source code could become quite large, especially for assembly language programs.

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MICROBOOKS

A SMALL BUT HARDWORKING BOOKKEEPER

16K, Ext. Basic

THE IDEA

I was a little amused, some time ago, when I saw a letter to a computer magazine editor asking for business programs for the 4K Color Computer. But, **MICROBOOKS** has become almost that. In its' shortest form the program could get about 100 entries into a 4K CoCo. At the same time it will do a pretty fair job with the books of a small business, given certain concessions.

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COPYNEW

COPYNEW – A DISK COPY UTILITY

Peter A. Stark
Star-Kits
P. O. Box 209
Mt. Kisco, NY 10549

Although the Color Computer's disk system has all the commands needed for use with Basic, their command structure is sometimes a bit awkward.

Take, for example, the COPY command. To copy a file from one disk to another requires that you specify the full file name of both the source file and the destination file. Moreover, if a file with the same name already exists on the destination disk, you get an error message and must start all over again.

While this is not too bad if all you want to do is copy a single file, it is downright annoying if you want to copy several files at once. Which leads me to the reason for writing a (fairly) simple Basic program called **COPYNEW**.

COPYNEW requires that you have two disk drives. To copy a set of files from one disk, simply place the source and destination disks into two different drives, **RUN COPYNEW**, and enter the drive numbers of the source and destination drives when requested.

Given the drive numbers, **COPYNEW** reads the directory on track 17 of the destination disk and copies it into arrays in memory. In this way it determines which files are already on the destination disk.

Next, it reads the directory of the source disk. As each directory entry is scanned, **COPYNEW** checks to see whether a file by that name already exists on the destination disk. If the name is found in the destination directory, **COPYNEW** also checks a byte in the directory entry which indicates how many bytes there are in the last sector of the file, and compares it with the corresponding byte on the source disk.

There are now three possibilities:

1. The file name already exists on the destination disk, and the number of bytes is the same. In that case **COPYNEW** simply displays the file name on the screen and tells you that the file already exists, and then goes on to the next file.
2. The file name already exists on the destination disk, but the number of bytes is different. Now **COPYNEW** displays the file name, but points out that the files appear different and asks whether you want to delete the old file on the destination disk and substitute the one from the source disk. You need just answer Y or N, and **COPYNEW** takes over.
3. The third possibility is that the file name does not exist on the destination disk, in which case **COPYNEW** tells you so, and asks whether you'd like to copy it. Simply answer Y or N.

It's a fairly simple and fast matter to go through the entire directory and just answer Y or N to have as many files copied as you'd like.

The test to compare whether two files are identical is only a rough one, and not very reliable. It is quite possible that two files are completely different, and yet the number of bytes in their last sector is the same. The only foolproof way to compare the two would be to read each one and do a byte-by-byte comparison; a process which would take quite a bit of time. I therefore settled on the above method, knowing full well that occasionally it might make a mistake. From the point of view of probability, there is one chance in 256 that two different files will have the same number of bytes in their last sector.

There is one rule I always follow to reduce this chance. Whenever I update any program, I always make sure to make it just a bit longer or shorter. In that way, if I ever use **COPYNEW** on two disks that have different versions of the same program, I will notice the difference and make a conscious effort to determine which is older and change it.

```
10 CLS: VERIFY ON
20 PRINT "COPYNEW - (C) 1982 BY
            PETER A. STARK."
30 CLEAR 2000
40 DIM DN$(68),L(68) 'DEST FILE
NAMES AND LENGTHS
50 INPUT "COPY FROM DRIVE NUMBER
"; D1
60 IF D1<0 OR D1>3 THEN 50 ELSE
70
70 INPUT "COPY TO DRIVE NUMBER";
 D2
80 IF D2<0 OR D2>3 THEN 70 ELSE
90
90 IF D1=D2 THEN 50
100 DN=0
110 S1$=":"+RIGHT$(STR$(D1),1)
120 S2$=":"+RIGHT$(STR$(D2),1)
130 'FIRST, READ FILE NAMES ON D
ESTINATION DISK
140 FOR SE=3 TO 11
150 DSKI$ D2,17,SE,A$,B$ 'READ N
EXT DIR SCTR
160 A$=A$+LEFT$(B$,127)
170 FOR J=1 TO 225 STEP 32
180 IF MID$(A$,J,1)=CHR$(255) TH
EN 240 'LAST ENTRY
190 IF MID$(A$,J,1)=CHR$(0) THEN
 220 'DELETED ENTRY
200 F$=MID$(A$,J,8)+"/"+MID$(A$,
J+8,3)
210 DN=DN+1 : DN$(DN)=F$
215 L(DN)=ASC(MID$(A$,J+15,1)) '
LENGTH
220 NEXT J
230 NEXT SE
240 'NOW DO ACTUAL COPY
250 FOR SE=3 TO 11
260 DSKI$ D1,17,SE,A$,B$ 'READ N
EXT DIR SCTR
270 A$=A$+LEFT$(B$,127)
280 FOR J=1 TO 225 STEP 32
290 IF MID$(A$,J,1)=CHR$(255) TH
EN END 'LAST ENTRY
300 IF MID$(A$,J,1)=CHR$(0) THEN
 600 'DELETED ENTRY
310 F$=MID$(A$,J,8)+"/"+MID$(A$,
J+8,3)
320 L=ASC(MID$(A$,J+15,1)) 'LENG
TH
370 'REM SEARCH DEST DRIVE
380 IF DN=0 THEN 560
390 FOR K=1 TO DN
400 IF DN$(K)=F$ AND L(K)=L THEN
 PRINT F$; " EXISTS" : GOTO 600
'COPY EXISTS
405 IF DN$(K)=F$ THEN 440 'EXIST
S BUT DIFFERENT
410 NEXT K
420 GOTO 560
430 'COPY EXISTS BUT HAS DIFFERE
NT LENGTH
440 PRINT F$: PRINT" EXISTS BUT
IS DIFFERENT."
450 PRINT "        -- COPY IT? ";
460 C$=INKEY$ : IF C$="" THEN 46
0
470 PRINT C$
480 IF C$="N" THEN 600
490 IF C$<>"Y" THEN 440
540 N2$=F$+S2$
550 KILL N2$
555 GOTO 570
560 'NO COPY EXISTS
561 PRINT F$; " DOES NOT EXIST."
562 PRINT "        -- COPY IT? ";
563 C$=INKEY$ : IF C$="" THEN 56
3
564 PRINT C$
565 IF C$="N" THEN 600
566 IF C$<>"Y" THEN 561
570 N1$=F$+S1$
580 N2$=F$+S2$
590 COPY N1$ TO N2$
600 NEXT J
610 NEXT SE
```

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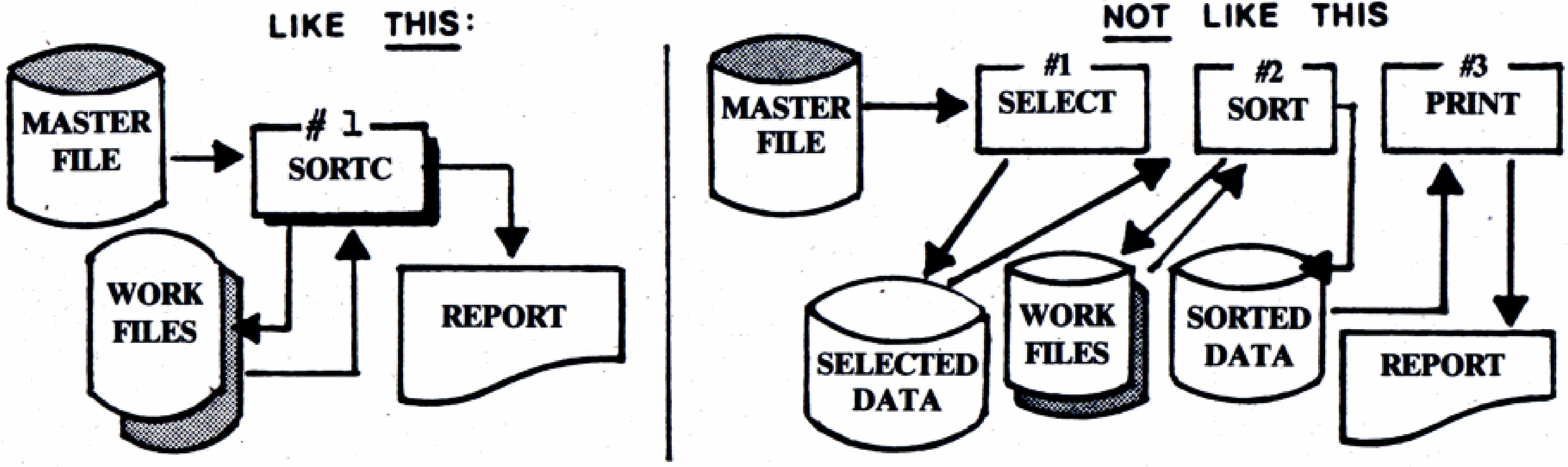
SORTC** for OS9*

THE ONE AND ONLY



BOLDLY GOING WHERE NO SORT HAS GONE BEFORE

SORTC is a high speed, full-record compounding disk sort, which gives microcomputer users mainframe capabilities. It has been specifically designed to sort data efficiently while offering the user great flexibility in designing sort programs. It is written in BASICO9* for use under OS9.

COMPOUNDING FUNCTION

SORTC has the capability of summing user-specified numeric fields on equality of keys. This allows significant savings in memory, disk space, and program development time. A reduction in the number of disk accesses required when compared to other sorts is inherent in the design of **SORTC.**

DISK BASED

Specifically designed to sort large volumes of data, **SORTC** imposes no size restrictions on the amount of data to be sorted. It also places no limits on the number of sort keys which can be used or the order in which the keys are sorted. Furthermore, the sort procedure can be performed as many times as necessary within the same program. This feature allows the programmer to take advantage of any existing data bias, and possibly even reduce the size of the sort key.

ADVANCED DESIGN

While most disk sorts are partially based upon the Fibonacci series, **SORTC** is not. **SORTC** is a generation ahead of the normal sorts based upon the "Fib series". Its unique algorithm is automatically optimized at run time for a reduction in workspace, reduced # of disk accesses and shorter run times. Designed to be as "crash proof" as possible, the sort procedure will not abort if it is accidentally asked to sort zero items.

EASY TO USE

It is not difficult to design a program which will use **JBM's SORTC**. Since **SORTC** is a subroutine, the user may write any procedure he or she wants to format the data for sorting and then to process the sorted data. The sorted data need not be written back to disk, but instead is immediately available. The sort code is automatically inserted into the source procedure by a simple Sort Generator.

ORDERING INFORMATION

SORTC, from **JBM's MIDWARE** line of quality software, is available on either five and one-quarter or eight inch diskettes for a price of $150.00. All of **JBM's** software packages come complete with comprehensive user's manuals.

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**Uses the same algorithm as JBM's SORTC for Digital Equipment Corp. RSTS Systems.

LINKING LOADER

Continued from page 1

Many editors used on microprocessors are limited to the size of the files they can process. Large Assembly Language programs take a long time to assemble, and an excruciatingly long time to print on the printers available for home use at home budgets. You also have to code any general purpose routine into EACH program.

You could keep each general purpose subroutine (module) in its own file, and merge it with the mainline code at assembly time (either by insetting the code in the source with the editor, or including it during assembly with INCLUDE or LIB calls). Then the main program would fit editor buffers better. However, at assembly time you still have a long assembly to process with the same problems mentioned in the last paragraph, as well as some other problems. You would have to be careful of conflicts between label and variable names. I once tried to set up a system of BASIC subroutines by assigning blocks of variable names and line numbers to the subroutines, and not use those names or numbers in the main programs. It worked, but it was hard to manage.

The other problem with this method is that you have to merge the modules manually, remembering the modules that the subroutines need.

You could merge binary modules after assembling. There would be no conflict with variable names, but you would still have to remember to include the dependent modules. The big problem with this method is providing the entry points of the subroutines to the calling routines.

DESCRIPTION

This brings us to the main feature of this article, the description of a **Linking Loader**. A "Linking Loader" is a Program which merges a Main Program with subroutines that are **not** defined (included) within the Source Code of that Program. In addition to merging the modules, it provides a means for routines within the complete program to locate these added modules.

The **Linking Loader** described here consists of a Loader Program and a Linking Module that becomes part of the main program. The Loader merges the main program with the required subroutines, as well as any subroutines within these subroutines. It also loads the Linker Module and saves the whole program to disk. The modules are stored in individual files on a disk. I have not written a library editor for this system yet. The entry point of the Linker becomes the transfer address of the main program. At run time, the Linker copies the entry points of the subroutines into a Jump Table. The calls to the subroutines MUST be **indirect calls** to the jump table.

There are assemblers available (that run under the FLEX Operating System) which can generate relocatable code and include a Linking Loader, and many compilers have the same facilities. The program I am proposing here will work with ANY assembler, but requires a little extra effort on the programmers part.

There are some programming conventions you will have the follow in designing each module that you want to link. You will have to code two new sections in **each** module, **including** the main program. Each section is simple, and in the final program does not use much memory. One section can be overlayed, so will not use any memory at all in the final product. You must assemble the subroutine modules at **location zero** and code them in **position independent code**. You can code the main program ANY WAY you like. The Loader appends the subroutines to the end of the main program.

Each module must have a program **"preface"** which must be at the very beginning of the module. The program preface is 9 bytes long, and contains the following 5 elements.

name	size in bytes	function
module number	1	module identifier
execution address pointer	2	pointer to entry point
next module pointer	2	pointer to next module
load list	2	pointer to load list
initialization	2	pointer to initialization routine.

The term 'pointer' means the value in the field is the **offset from the beginning of the module**. I will describe these terms in detail later.

The second section you must code is the **list of external modules**. This is the list of Filenames of the files which contain the subroutines. Since there is no library editor, each file must contain only ONE module. Each Filename must be in Radio Shack Format format followed by a **one byte binary zero** ($00) for the Radio Shack DOS, or in FLEX format followed by a **one byte binary 4** ($04) for the FLEX DOS. The list MUST be terminated with a hex FF (-1). The offset to the list is in the preface.

When the Loader loads a module, it builds a table of external filenames. It then loads each module in the list and appends it to the end of the last module. The end of the module is pointed to by the next module pointer in the preface. If the modules have a load list, those names are added to the program load list if they are not already in the list.

You can code the list anywhere you like, but it is best to code it at the end of the program. The Loader needs the load list **only** while loading. If it is at the end of the program, it can be overlayed by the next module, saving a significant amount of memory. You can accomplish this by making the **next module pointer** and the **load list pointer** point to the same address.

After loading all of the specified modules, the Loader loads the Linker and copies the program to disk. The program is now ready to execute.

EXAMPLE PROGRAM

As an example, let's code a program which gets a character from the terminal, calls a subroutine to convert the character to upper case if it is lower case, and display the character on the screen. The jump table has been located at $0E00.

```
TOUPER EQU $0E04      ADDRESS LOADED INTO $0E20
*                       BY THE LINKER.
PREFAC ORG $0F00
       FCB  0         MODULE NUMBER
       FDB  MAIN-PREFAC EXECUTION ADDRESS
       FDB  XTRN-PREFAC NEXT MODULE LOAD ADDRESS
       FDB  XTRN-PREFAC EXTERNAL SUBROUTINE TABLE
       FDB  0           INITIALIZATION ROUTINE
*  END OF PREFAC

MAIN   JSR  [$A000]   GET CHARACTER FROM KEYBOARD
       JSR  [TOUPPER] CONVERT TO UPPER CASE
       JSR  [$A002]   DISPLAY ON SCREEN
       RTS            RETURN TO BASIC
XTRN   FCC  'TOUPER.LIB',0
       FCB  $FF
       END  PREFAC
```

The module number really isn't used in the Main Program, but it is needed to fulfill the requirements of the preface. Notice how the pointers in the preface are coded. The values in the pointer fields of the preface must be offsets from the beginning of the program, which is the beginning of the preface, to the code the field represents.

Notice that the next module pointer points to XTRN. Remember in a previous paragraph, I pointed out that the filename list is needed only by the Loader. It copies the filenames into a table **after** it loads the module. It can then overlay the filename list with the next module. A program which calls many subroutines could have a large filename list, requiring hundreds of bytes. You can save a lot of memory this way.

Also note that the initialization routine pointer is zero. That means there is no initialization routine. If there was an initialization routine, its pointer would be coded like the others. The initialization routines are called by the linker **before** passing control to the main program. If there were no external subroutines, that pointer would be zero also. There **must** be a pointer pointing to the entry point.

Now let's code TOUPER.

```
       ORG 0        SUBROUTINES START AT 0
PREFAC FCB 2        MODULE NUMBER
       FDB TOUPER   ENTRY POINT
       FDB TERM     NEXT MODULE
       FDB 0        NO EXTERNALS
       FDB 0        NO INITIALIZATION
TOUPER EQU *        BEGIN CODE
       CMPA #'a
       BLO EXIT     GO IF NOT LOWER CASE ALHPA
       CMPA #'z
       BHI EXIT
       SUBA #$20    CONVERT TO UPPER CASE
EXIT   RTS
TERM   EQU *        NEXT MODULE
       END PREFAC
```

Notice that the load address is zero. This is mandatory for subroutines, but the Main Program can load ANYWHERE in memory. It is not apparent from this example, but subroutine modules must be written in position independent code. This is because they may be loaded anywhere in memory. Main programs do not have to coded in position independent code.

Compare the module number with the address of the jump table entry which is defined in the main program. Notice that the address of the module's jump table entry is $0E04, or 4 bytes from the beginning of the jump table. That is twice the value of the module number. That is how the Linker determines where in the jump table the entry point of the module will be stored. As a result, all modules which will be used in the same program must have unique module numbers.

Since this module doesn't call any external subroutines, or have an initialization routine, those pointers are 0.

A listing of the Loader program is provided with this article. The program is available on disk from **Southeast Media Supply**, P.O. Box 794, Hixson, TN 37343, (615) 842-4601, on a Radio Shack Color Computer or FLEX formatted disk, for $39.95. The Radio Shack Disk contains the Assembled File, "LOADER/BIN", and the Source Code for use with the Micro Works MACRO-80c Assembler. The FLEX Disk includes the Source only, so that it can be assembled either way, for the TSC Macro Assembler. The major differences are in the I/O routines. A description of the code follows.

The LINKING LOADER Programs

BASIC's stack is saved for return to BASIC. By setting the buffer end 50 bytes below the stack, the buffer size is automatically set according to the amount of memory (you may need to adjust this if your program will require more Stack space).

The user is prompted to enter the Input and Output Filenames. The input file is the binary main program. The output file will contain the merged main program and all the external subroutines. If the output file is not named, the output will overlay (REPLACE) the input file with the Radio Shack DOS; FLEX will assign the Input Filename with a CMD Extension. The default extension is BIN.

The filenames are broken into their constituent parts by calls to the operating system in the subroutine PARSFN. This will be described later.

In the routine labelled MAPDSP, the output device for the load map is specified. The map can be directed to the Screen or the Printer. The output device number is stored in DSPDVC. The default is the Screen.

The code at the label LOAD is where the load is initialized. The main program is loaded first. The flag MODCNT is reset to indicate that the main program is being loaded. Some of the buffer pointers are initialized. LDADD contains the address of the module currently being loaded. RECADD contains the address of the binary record currently being loaded. MODTAB points to the next entry to be read from the module name table. TABEND points to the last entry on the table.

The module name table, MODTAB, can contain 30 12 byte entries; an 8 byte filename, a 3 byte extension, and a binary drive number. Each field must be left justified and blank filled on the right. Each entry must be followed by a binary zero for Radio Shack, or a binary 4 for FLEX. The last entry must be a $FF.

After a module is loaded, the address of its external reference list is obtained from the preface. Each entry is converted into the form described in the previous paragraph, and compared with the entries already on the table. The compare is made on all 13 bytes. You might want to change this to compare on only the 8 byte filename. If the module is already in the table, it is not added. Otherwise, it is added to the end of the table.

At the label LOAD1, the break key is checked and the program is stopped if the key is depressed in the Radio Shack version.

Before opening the file, the filename is displayed on the load map. If there is a file error, the filename tells the user which file is in error. The file is then opened. RECFLG is reset, indicating the first record of the file. RECFLG is used later, with the main program flag, to indicate that the record contains the load address of the program. All files use device number 1.

The code at the label LOAD2 starts the read file loop. The first byte of a binary record is the flag byte, or the record descriptor byte. As far as I can tell, the only record types are 0 for a data record and $FF for an End Of File record in the Radio Shack system. The record length and the record load address are saved on the stack temporarily, and the next byte read will be the first data byte of the record.

If it is the first record of the main module, the offsets are calculated. OFFSET is used for calculating the load addresses in the buffer of the subsequent records as they are read in. OFFST1 is used for calculating the load address of each module as it will be loaded for execution. OFFST1's only purpose is for displaying the address on the load map.

The code from LOAD4 to LOAD5 calculates the beginning and ending address of the current record. The code from LOAD5 to LOADF reads the record into the buffer.

The code at LOADF is the end of file processor. Here, if it is the main module, the Loader displays a message and pauses so the user can load a library disk if he wishes.

After loading each module, at the label LOADC the preface is checked for an external reference table. If there is one, the module names are loaded at the end of the Loader's table. The name of the next module is taken from the beginning of the table at LOADN. The name LINK.BIN is added to the end of the list so the linker can be added after the last user module. Control is passed back to LOAD1 and the next module is loaded.

After the last module is loaded, control is passed to BINOUT where the concatenated program is written to disk. Note that the program has not been linked. Linking occurs at **execution time.**

The offset from the Linker Module to the main module is saved in the linker's preface in the entry point field. The Linker's transfer address is used as the Program transfer address, where execution will begin. The transfer address and the end address is displayed on the load map.

Before copying the program to disk, the Loader program displays a message and pauses to allow the user to load an output disk. An EOF record, with the transfer address, is written at the end of the file.

Note that ROM Routines are called for disk and terminal I/O in the Radio Shack version. This program will work on the older Color Computers with Version 1.1/1.0/1.0 ROMs, but I don't know if it will work on the new Color Computer 2's, Dragons, or TDP's (the TDP's should be OK - Editor). All of the FLEX calls are standard, so there should be no problems with different FLEX Conversions.

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SUBROUTINES

BINNHX	CONVERT BINARY TO ASCII ENCODED HEX FOR DISPLAY
BRAK	BREAK PROCESSOR - RETURN TO BASCIC
COMPAR	COMPARE TWO STRINGS
DSPADD	DISPLAY THE CONTENTS OF D IN HEX
DSPMOD	DISPLAY 8 CHR FILENAME
GETADD	EVALUATE ABSOLUTE ADDRESS OF DATA IN MODULE PREFACE
INPUTP	ISSUE MESSAGE TO TERMINAL AND WAIT FOR INPUT
INXCHR	SCAN STRING FOR SPECIFIED CHARACTER
LENSTR	LENGTH OF STRING TERMINATED BY ZERO BYTE
NOMEM	PRINT OUT OF MEMORY CONDITION
NOTAB	PRINT MODULE TABLE FULL
OUT2	OUTPUT THE 2 ASCII CHARACTERS IN D
PARSFN	PARSE A FILE NAME FOR ITS COMPONENT PARTS. The filename is entered in RS standard format. A rom routine is called which parses the string and stores it in an O/S buffer. If the caller specifies an output buffer, PARSFN copies it to the buffer
SEARCH	SEARCH A TABLE FOR A SPECIFIED STRING
SOPEN	OPEN A DISK FILE

VARIABLES

The comments on the variables in the Source Listing should be self explanatory. However the buffer pointers probably need more explanation.

The variables PGMADD, XADD, and OFFST1 refer to the program as it will be loaded for execution. They are used for displaying the memory map, and for storing the load address and transfer address in the binary disk file. XADD is the entry point for the Linking Subroutine which is added to the end of the linked modules by the Loader. The Linker Subroutine gets the entry point of the User's Program from the main module's preface.

The variables LDADD, RECADD, ENDADD, PGMTOP and TABEND contain the addresses as the program is loaded into the Loader's buffer.

The Linker is appended to the end of the program as if it were a subroutine. The entry address of the Linker becomes the transfer address of the program. The Linker obtains the entry points of all the modules and stores them in the jump table, then passes control to the main program.

The address of the jump table of this Linker is at $0E00, identified by the label BASE. The jump table can be anywhere in RAM. I chose $0E00 because I write programs for computers with different memory sizes. I would think that a better choice for most people would be at the top of their RAM.

The code at the label START is where the Linker starts execution. This becomes the Transfer Address of the Program.

Remember that the Loader stored the value of the offset from the beginning of the Linker to the beginning of the Main Program in the entry point field of the Linker's preface. The Linker now uses that to calculate the address of the main program's preface and saves it on the stack.

The address of the end of the Linker Module is stored at location 254 of the jump table. This marks the end of the code for the program, and the beginning of free memory. You can use this for dynamic memory allocation, for scratch area, or anything you like. I haven't used it for anything yet.

The code at LINK1 is where the linking is done. The address of the next module is calculated from the next module pointer. The module number is used to calculate the address in the jump table where the entry point of the module will be stored. The formula is **BASE + 2 x module#**. The Entry Point is calclated and stored in the jump table. This code is executed for each module.

At LINK2 we start calling the initialization routines of the modules. The address of the Main Program is obtained from the stack, and control is transferred to LINK34. The offset to the initialization routine is obtained from the 'preface'. If it is not zero, the address of the initialization routine is calculated and the routine is called. Control is then passed back to LINK3, where the address of the next module is calculated. This loop is executed for all modules, until we reach module number zero in the Linker Module.

At LINK4 the address of Main is pulled from the stack, Main's Entry Point is calculated, and control is passed to it.

Roland Waggoner

- - - - - - - - - - -

Next Month we will cover the OPERATION of the **Linking Loader** with RS DOS and FLEX, and the provide the complete Assembly Language Listing.

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Press Release

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The Micro Works is pleased to announce the release of a graphic development utility for the Radio Shack Color Computer. MagiGraph is for experienced Basic and assembly language programmers. The program simplifies the task of drawing highly detailed graphic characters, up to and including an entire high-resolution graphic screen. MagiGraph has a full set of logical operation and pixel manipulation functions that simplify the development of a character in all its different possible color and position combinations. The program offers nine animation buffers, which allow the various positions of an animated character to be tested and revised so that animation blends together smoothly. Finally, the pixel codes of a graphic character can be listed in hexidecimal numbers to a printer, and the graphic screen can be saved on cassette tape or floppy disks to be used later by another program or revised with MagiGraph.

MagiGraph, written by Kevin Dooley, is available on cassette for $34.95(16K required); disk for $39.95(32K Extended Color BASIC required); Amdisk cartridge for $44.95. Extensive documentation and plenty of sample programs are included in the package.

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MICROBOOKS

Continued from page 1

Actually, "very small business" is a better way of putting it. I used to call my one man repair operation a small business. But, I learned that Uncle Sam calls a business small if it is only worth a few million, so now I call the operation a micro business. Hence, the name of the bookkeeping program I wrote and use, **MICROBOOKS**.

The program is job oriented and small, just like my business. (More about this in the section on using the program.) It is well suited to someone who wants to find out if he wants to do this kind of thing on a computer without putting a lot of money into it.

THE PROBLEM

Finding a program that I could afford, which would give me quick and current information on how I'm doing on any particular job, seemed to be impossible. Having only a 16k Extended Basic CoCo, in addition to the family TV and cassette recorder, my aim was a small program with only essential features. Really, it is little more than a means of getting the data on tape. By omitting Printer routines and Statement and Balance Sheets, **MICROBOOKS** is small enough to fit into 16K and still accept well over 200 entries of expense and/or income, provided you use **POKE25,6:NEW** before loading. In this simple form you can put on tape only what you can fit into memory; but, if you make monthly tapes, you can put a lot of data through **MICROBOOKS**. If there is enough reader interest, we can publish Printer and Balance Sheet routines for **MICROBOOKS** in the future. These routines can be plugged into places provided in the program, or loaded separately, saving memory.

My own setup will squeeze a Quarter (3 months) of business into the 16K Extended CoCo. Of course, 32k would increase that to a Quarter for a bigger business, or 6 months of Books at my current rate. To do this with the program as it is, I write down the totals from each tape, but they could be carried forward to the next tape if desired.

THE PROGRAM

MICROBOOKS bears no resemblance to spreadsheet programs. I tried Radio Shack's "SPECTACULATOR", but it is really not a Ledger Program, and I found it to be rather slow to use and not especially "friendly". **MICROBOOKS** is menu driven, has fair error trapping, and takes data very quickly through screen prompts. Its main functions are to

1. Enter and store data
2. Retrieve and display data
3. Display sub-totals

While entering data, several opportunities are given to correct entries. You can scroll your files at a controlled rate for general viewing and indirect editing.

MAKING THE PROGRAM SMALLER

Since I first talked to Bob about publishing this program, I have worked on making it smaller and smaller by various means of rewriting and compacting, so there are two listings for comparison. The first is the earlier, more easily read, version - which uses about 4.5K of Memory. The other is a much later version with many multiple statement lines and other space saving features. It takes about 2.5K of Memory and does the same job. We'll talk about the job of making programs smaller as we go along. I'll assume that folks with a minimum memory computer are probably beginners like me, and write in considerable detail on most things.

THE ORGANIZATION

Listing 1
    0001. Parameters
    1000. Main Menu
    2000. Expense Entries
    3000. Income Entries
    4000. Totals Routines
    5000. Expansion Space
    6000. File Scan

Listing 2
    0010. Parameters
    1000. Main Menu
    2000. Ledger Routines
    3000. Totals Routines
    4000. File Scan
    5000. Expansion Space
    6000. Subroutines

Listing 1 is included for those interested in how BASIC Programs can be made smaller. While some reference will be made to Listing 1, most of the following discussion concerns Listing 2, which actually provides more functions.

THE DETAILS

Setting up the CLEAR and DIMension Statements involves a certain amount of trial and error. In my use of the program, I have decided to abbreviate Check entries as much as possible, to save space, since I would probably need to return to the originals for proof of records anyway. As long as I can recognize the information, I'll cut it as short as I can to save memory. By doing this, I have reduced the average entry size to about 20 bytes. You will probably use more at first, as I did. If you even use 25 bytes, you will get an unuseable clear size. As it stands, the **CLEAR 5000** gives about 22 bytes for each of the 230 entries dimensioned.

Dimensioning is simple enough at first glance. You just type **DIM**(one less than the number of items in array). The problem is: how many can you get in after the dimension statement gobbles up memory? According to my experiments, you will

STAR — KIBBITS

Welcome to the tenth of my monthly chats. Many of you have commented that you enjoy reading them, and they are interesting to write too. So here goes for this month.

In addition to having a Color Computer, do you also have a 6800 or 6809 system on the SS-50 bus? I do, and I suspect some of you do too. I often get a letter from a reader who either wants to buy or sell such a system or components (hardware or software) for it. Unfortunately, some of the older items are hard to get, yet some of you may have an unused one stashed away in the cellar. So why don't we set up an

SS-50 EXCHANGE

If you have some SS-50 item for sale, send me a self-addressed stamped envelope with a description and price written on the back. If you want to buy an SS-50 item, send me a postcard with a note on what you want. I will try to match up a buyer and seller, put the buyer's postcard in the seller's envelope and mail it back out. From that point on, it's up to the seller to contact the buyer and make the deal.

I'm proposing this simply because I really like 6800 and 6809 systems, and hate the thought of something going to waste in someone's cellar, while someone else is desperately looking for it. (as an afterthought, let's extend it to anything that is 6800 or 6809 related.) But since this may potentially involve a lot of work for me, I insist that you follow the rules: postcards for buyers, stamped envelopes for sellers, only one item per card or envelope, clearly stated on postcard or back of envelope.

Now let's see whether we can rescue some of those gems in the cellar or attic!

AMDEK TOO

Yes, we've gotten a pair of Amdek 3" drives, and now supply our software on Amdek disks too. Just specify on your order. There's a $3 extra charge due to extra handling and higher media costs. By the way, those little 3" disks are neat.

SPEAKING OF NEAT THINGS

The little MC-10 computer is also quite neat. It uses a 6803 microprocessor, which is more like a 6800 than a 6809. I'm sure that it's used because it contains two input/output ports which save the expense of an external I/O chip. Interestingly enough, the 6803 has a built-in port for serial input and output, but the MC-10 doesn't use it because it doesn't support 600-baud operation, needed for compatibility with the larger Color Computer. Instead, serial output is handled the same way as on the Color Computer, with a software routine. Though the manual doesn't say so, you can change the output baud rate by an appropriate poke. For example POKE 16932,245 switches the output to 300 baud. You can try other values for other baud rates too.

By the way, the MC-10 also has the CLOADM and EXEC commands, though the book doesn't mention them. We use those in our MC-10 software. Available so far are the HUMBUG monitor, REMOTERM remote terminal package, and COMMTERM communications program. A disassembler is coming too.

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lose about 7 bytes for each element in the dimension statement. If you have one DIM(230), you will lose about 1600 bytes of memory. If you have two DIM(230)'s, It will be about 3200. **MICROBOOKS** has six, which uses roughly 9.5K. Perhaps someone can give us an accurate way to calculate it. I have had different programs show a byte loss of from 5 to 7.

To experiment with these parameters, use the BASIC EDIT Command to put in different **CLEAR** and **DIM** sizes, then **RUN** again. If you have reserved too much space, you will get an **OM** ERROR, which breaks you out of the program. This means you ran out of memory before the CLEARing and DIMensioning were complete. If you do not get an OM ERROR, you know it goes into the memory you have available, but then you will want to know if you have enough room left to use the Program. Type **PRINT MEM** or the shorter **? MEM** (? is short for PRINT) and <ENTER> to see how much room you have left.

It would be a good idea to leave two or three hundred bytes in memory. The computer will use a certain amount as it functions, and will break out with an OM ERROR if enough room is not available. **MICROBOOKS** seems to need about 175 bytes above the program memory, but I leave more just to be sure it doesn't bomb.

Since GOSUB's make it hard to follow a program, here's a rundown of the Subroutines in **MICROBOOKS**.

6000. SELECT ONE
6100. YOUR SELECTION
6200. Tape loading
6300. NOT PROGRAMMED
6500. Scan screen print
6600. ANOTHER SCAN?
6800. IS TAPE LOADED?

PROGRAM DESCRIPTION

One of the fun things about programming is that you can do ANY job in more than one way, and many jobs in many ways. Sometimes you will need to change something a little in order to use it for more than one function. For instance, do a little comparing of IF-THEN and INSTR.

The menu section in Line 1000 begins with a GOSUB to print a prompt above the menu. If you don't make use of Subroutines in your Programs, you are probably using too much memory. Just about anything that must be done more than once will use less memory if it is put into a Subroutine. This is one of the ways I cut down the size of the original program. Also in Line 1000 is the setup of the Main Menu, with numbers leading to the ON GOSUB in Line 1010. The last statement forms an "Error Trap" to prevent numbers other than the Menu selections from sending you on a wild goose chase, or bombing the program. If you enter the wrong number, the program simply prints the menu again. Of course, this happens so fast you hardly notice it. A proper choice sends you through Line 1010 to the Line Number for the selected routines.

Starting at Line 2000 is, first, a Sub-Menu for either Old or New Tapes, and then another kind of Error Trap. **IF** you give a valid number **THEN** you go to a line number, or **ELSE** back to the Menu again. Line 2020 asks if you have already loaded the tape and sends you through Lines 2400 to 6200 to load it if you haven't. If you have loaded a Tape, you go to Line 2100 to begin the actual entry of data.

Line 2100 represents a lot of head scratching. It was easy enough to put in the instructions on how to exit the Entry Mode, but I wanted to have numbers from the last two entries to keep myself oriented as to where I was. The problem appeared when I tried to go to the Entry Mode without having previous entry numbers already in, as is the case when starting a new tape for a new period. If I called for only one back number, it would just leave that place blank; but if I called for TWO back numbers when there were none, I would get an FC ERROR. So, by checking whether "1" had been chosen from the menu (NEW FILE), I would know whether a file had been loaded or I was starting a new one, and therefore, whether back entry numbers were available. If not, the back number call is bypassed until after the first entry by IF-THEN'ing to Line 2105. Because Line 2100 is used over and over, it would not do to have the back numbers skipped every time, so Line 2105 nulls "S" to allow the program to get past the IF-THEN the next time around and all times thereafter. It also spaces down one line on the screen for display clarity. The GOTO in Line 2100 skips the space in 2105 after the first entry. Actual input of data begins at 2110.

Since this is also your location when you are finished Entering Data, an IF-THEN tests for "XX" (which is the signal to the Program that you are finished entering data), and if XX is input, you are sent to Line 2180 to Save your Data to Tape. Similarly, the next two lines test for CC, which is the sign for "correction needed", and sends you back to start that input over again.

The next point of interest is in Line 2140, where you have **one more chance** to correct your current entry. INPUT and <ENTER> are used here instead of INKEY$ to provide some error trapping. The truth is that the trap only half works, because I felt that it would be a lot faster if you didn't actually have to hit Y each time you had finished an entry. While "N" will return you to the start of the same entry again, you will go to the next entry if you hit the <ENTER> key.

Line 2170 sends you back to 2100 after incrementing N by 1. In your first entry, input N will be input number 1. The next one will be input (N+1) or 2, since N is now equal to N+1, and so on until you finish.

After you have ended your Input (entries), Line 2180 will ask how many times you want the data saved. I put this in because I had had so many tape glitches that one save was useless. By having several saves in the tape (I usually have 3 or 4), you can always find a good one. I have greatly reduced the problems, but that is another subject. At any rate, you may save as many times as you wish. The variable SA carries the number of saves desired into the FOR-NEXT loop in Line 2300. A FOR-NEXT loop is nothing more than a counter which counts from the number before the TO to the number after the TO. If you press <ENTER> without a number, the 1 in **FORV=1TOSA** (Line 2300) becomes the only number to be counted, therefore only 1 save is made.

Oine 2300: By putting the prompt "STORING DATA" in the middle of the screen, you can help eliminate that nagging feeling that maybe the computer is hung up while it is sitting there saving large amounts of data. Of course, you could turn up the sound and listen to the 1's and 0's fly, but that gets old fast. You may want to try changing the CLS (which clears old information off the screen) to CLS0. By doing this you will have a black screen while saving the data. When it goes green again, the save is done. If you try this, you'll also want to put a semicolon (;) between the quote (") and the colon (:); this will prevent the green from running out to the edge of the screen after the prompt. Also, if you put an extra space before and after the prompt (inside the quotes), it will look a little better.

You will also find an example of a "Nested Loop" in Line 2300. The innermost loop prints the array to the Tape starting at the first X, in this case 1, and looping (counting) until the N'th X. N is equal to the number of entries you made, and determines how many loops are required to complete the array. Each loop (the term loop applies both to the FOR-NEXT loop itself, and to each cycle through the loop) prints one entry, and when all strings in that entry are printed, the NEXT tells FOR to loop again for the next higher number. Thus each entry is printed in turn until the entire array is printed.

Note that since N has become a total, the "print to tape" part uses X to count its' way up to N. Note also that after the cassette File was opened for output (**OPEN"O",#-1**), and the Save given a name ("LEDGER"), the value of N was printed to tape for later reference (**PRINT#-1,N**). When N number of loops has been made, the cassette File is closed, and control moves on to the next thing, which is actually another loop inside the X loop in the nest. This T loop is only a timer to allow space on the tape between saves. Again, control moves on. This time, a comma is substituted for a NEXT, but the effect is the same and a few bytes are saved. The program moves to the next loop back that has not been done, namely the V loop. It loops SA number of times, the number of saves you called for, and goes on. After the prompt there is another timer, to give you time to read the prompt, and then you go back to 1000, the menu.

NOTES for the beginners:

Each entry you made had six parts, called strings. The number, for instance, became NU$(N), the date became DA$(N), the amount became AM(N) etc. As each entry was made, it was given a number to replace the N in each string in that entry. Since each entry is numbered in order, each is printed to tape in the same order by the PRINT #-1,NU$ etc. #-1 is the basic word for the tape recorder.

When you want to add data to what you already have, first choose Number 1 from the Main Menu for LEDGER and then Number 2 from the Sub-Menu for EXTEND FILES. You are then sent to Line 2400, which handles the loading of the most recent tape data into memory. A GOSUB sends you to Line 6200, which loads the data by reversing what was done in Line 2300. The value of N is

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loaded first (remember the PRINT#-1,N) so the computer will know how many entries there are. Then the loops go to work as before.

After the data is loaded from Tape, you go back to Line 2100 to enter data the same way as before. But, there is a difference. Rather than starting with 1, the computer starts with the current value of N which was just loaded. After each entry, the value of N is increased by one (remember the N=N+1), and when the entries are completed, you will have a new N total. Starting out with the same number you ended up with on the last tape might look like it would replace the last entry you made and, in fact, it does. But, remember that your last entry was XX to signal the end. Starting out with the same number causes the first new entry to go where the XX was, so there will be no lost space. When the save is made, the old array and the new array are saved together as one new array, so you will not have to keep the old tape unless you want it for a partial backup.

The next section of the program starts with Choice Number 2 on the Main Menu - "TOTALS". You are branched to Line 3000 for a Sub-Menu. After a quick GOSUB for a prompt, there are three chioces. You will soon find that **only the first one works** as of now. As mentioned, a Balance Sheet has yet to be added, but it could be included in the space provided by choice #2. Choice #3 is similar. GOSUB6100 is another screen prompt, and the branching and loading which follow should be familiar now.

The TOTALing Routine is similar to the one on page 229 of the Radio Shack "GETTING STARTED ..." Manual that comes with your CoCo. It would have been nice if they had bothered to tell you that that little program only works for ten checks. I learned that this is because the computer will automatically dimension an array for 10 elements if you have not specified any other number. For some reason, I had a real hard time getting this information; maybe I missed something in the book, but I sure didn't know it. Finally, I got the information I needed concerning arrays, not from a Computer Center, but from Roger Bryson, who worked in a local Radio Shack Store at the time. I certainly got a lot of help from Roger, and I wish him luck in his new business.

When the input is made answering "JOB OR ACCOUNT?", the B$ labels it as just that - B$. A loop is set up based on N again, but this time a different routine is placed between the FOR and NEXT which searches for a string that is the same as B$. Once again, the array is gone through from 1 to N. If a string match is found under ACCOUNT or (ELSE) JOB, the amount listed under the same entry number is added to T, which was set to 0 at the beginning. More loops are completed, and each time a match is found, the corresponding amount is added to T until all matches are found; the TOTAL is then printed for that string.

When I think I have an understanding of PRINTUSING that is adequate, I may write some about it. In the meantime, I'll just say that it keeps your figures in the right place, and let you look in the manual for information.

At the end of Line 3140, GOTO3130 sends you back for another search based on another JOB Number or ACCOUNT. T is reset to 0 to clear the way for another totals routine.

A lot of lines in this program open with a CLS in order to keep the screen neat. While I wanted to Clear the Screen before this part, I couldn't put a CLS at the beginning of the line because I wanted to have several totals on the screen at once. If it was there, it would clear each total before another was printed. That is why you see the CLS at the end of the previous line. This is one of several improvements over the larger program in listing 1. The CLS could have gone on a line of its' own, at the expense of several bytes of memory.

Lines 3200 and 3300 are spaces for future routines, as mentioned earlier. The subroutine displays a message and times it for several seconds, then returns to the main menu.

The SCAN Routine starting at Line 4000 is for the purpose of looking at your files after they have been put into Memory and/or on Tape. First you are asked whether you have loaded the Data Tape, which is really asking if the current data is in memory, not whether you have put a tape in the recorder, etc. If the data is already in memory, you go directly to the SCAN Sub-Menu. If not, then you get a subroutine which loads the Tape. This is the same subroutine that is used to load for the LEDGER extension and for the TOTALS retrieval. The Tape Load prompt could have been put in a common sub-routine, but, as it now stands, it identifies where you are in the program in case that information is needed.

Lines 4070 and 4080 both have nested loops as well as sub-routines which do work during the main loop. The sub-routines print your files to the screen, but, since the printing is done so fast, it must be slowed down by the nested timing loop. Each time an entry is printed, time is counted off before the next one is printed. If you see something you want to copy you can press **SHIFT @** to stop the scrolling.

NOTE for beginning beginners

Your manual tells you that **SHIFT @** will pause program execution. You do not need to hit them at exactly the same time. I like to press first **<SHIFT>** then **@** in a sort of rocking motion. Your manual also says to press any key to continue. Since **P** is right next to **@** I always use it when pausing and continuing.

Instead of the nested timing loop, you could experiment with straight printing statements putting **POKE359,60** before the print and **POKE359,126** afterwards. This will print one character at a time to screen, which is much slower. The strings have been placed onto the screen in a way that fits them all onto two lines. This allows several entries to be on the screen at the same time, which is more than some commercial programs allow.

Line 6500 begins with a **PRINT** Statement which spaces entries apart for better readability. For some reason, the first ten or so lines do not space??? The **TAB** Statements are similar to typewriter tabs. The item is printed at that number of spaces across the screen. The **PRINTUSING** statements keep the numbers right justified, as well as covering a rounding glitch in which the computer sometimes prints an unwanted number of digits to the right of the decimal.

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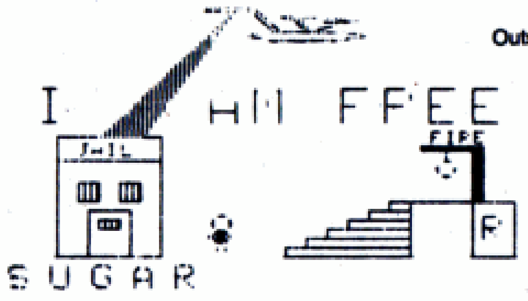

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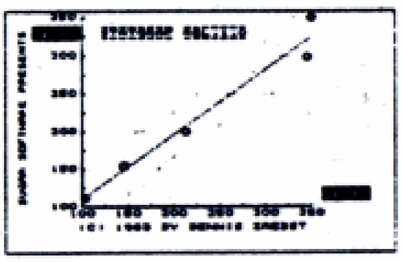

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- Create your own character set
- Automatic recognition of single or double density and single or doubled sided
- All features available for either single or multiple drive systems
- Settable Disk Drive Seek Rates
- Faster High Resolution Video Display with 5 different formats
- Save RS Basic from RAM to Disk
- Move RS Basic to RAM
- Load and save function on FLEX disk
- 24 Support Commands 12 with Source Text
- External Terminal Program

DATA-COMP has everything you need to make your TRS-80C Color Computer WORK for YOU; from Parts and Pieces to Full Ready To Use Systems. DATA-COMP designs, sells, services, and SUPPORTS Computer SYSTEMS, not just Software. CALL DATA-COMP TODAY to make your Computer WORK FOR YOU!

System Requirements

FLEX9 Special General Version + Editor & Assembler (which normally sell for $50.00 ea.)	$150.00
F-MATE(RS) FLEX9 Conversion Rout. for the RS Disk Controller	
when purchased with Special General FLEX9 Sys.	$ 49.95
when purchased without the General FLEX9 Sys.	$ 59.95
Color Computer with 64K RAM and EXT.BASIC	$399.95

SPECIAL SYSTEM PACKAGES

64K Radio Shack COLOR COMPUTER, Radio Shack COLOR DISK CONTROLLER, a Disk Drive System, Special General Version of FLEX9, F-MATE(RS), and a Box of 10 Double Density Diskettes, a COMPLETE ready to run SYSTEM on your Color TV Set.

$999.95

64K Radio Shack COLOR COMPUTER, Radio Shack COLOR DISK CONTROLLER, a Disk Drive System, and a Box of 10 Double Density Diskettes, a COMPLETE ready to run SYSTEM on your Color TV Set.

$799.95

DISK DRIVE PACKAGES, etc.

These Package **include** the Radio Shack Disk Controller, Disk Drives with Power Supply and Cabinet, and Disk Drive Cable:

PAK #1 - 1 Single Sided, Double Density Sys.	$389.95
PAK #2 - 2 Single Sided, Double Density Sys.	$675.95
PAK #3 - 1 Double Sided, Double Density Sys.	$569.95
PAK #4 - 2 Double Sided, Double Density Sys.	$919.95
PAK #5 - 2 Qume Thinline Double Sided, Double Density Sys.	$699.95
PAK #6 - 2 Tandon Thinline Single Sided, Double Density Sys.	$599.95

PRINTERS

EPSON RX-80	$375.00
EPSON MX-100	$725.00
EPSON MX-80	$395.00
EPSON FX-80	$599.00

SERIAL BOARDS

MX-Series	$119.95
RX-FX-Series	$ 99.95
Spectrum MX-Series	$ 54.95
Mark Data Keyboards	$ 67.95

FLOPPY DISKETTES

	MEMOREX	VERBATIM
5" Soft Sector Disks		
Single Sided Single Density	$2.40ea.	$2.75ea
Single Sided Double Density	$2.40ea	$2.75ea
Double Sided Double Density		$4.92ea
Plastic Storage Box		$2.00ea
8" Soft Sector Disks		
Single Sided Single Density		$3.75ea
Single Sided Double Density		$4.10ea
Double Sided Double Density		$4.75ea
Plastic Library Box		$5.00ea

PARTS AND PIECES

Radio Shack Disk Controller	$169.95
1 Single Sided, Double Density Disk Drive Tandom	$229.95
1 Double Sided, Double Density Disk Drive Qume	$319.95
1 Qume Thinline Double Sided, Double Density	$249.95
1 Tandon 40 Track SSDD with Cabinet and Power Supply	$259.95
Single Drive Cabinet with Power Supply	$ 79.95
Double Drive Cabinet with Power Supply	$109.95
Single Drive Disk Cable for RS Controller	$ 19.95
Double Drive Disk Cable for RS Controller	$ 24.95
Micro Tech. Prods. Inc. LOWER CASE ROM Adapter	$ 74.95
Radio Shack BASIC Version 1.1 ROM or 1.2 ROM	$ 34.95
Radio Shack Extended Basic ROM	$ 74.95
Radio Shack Disk Basic ROM 1.1	$ 29.95
Screen Clean - Clears Up Video Distortion On Your Color Computer	$ 39.95
Set of Eight 64K RAM Chips w Mod Instructions	$ 49.95

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AT LAST!! A FULL BLOWN DISASSEMBLER FOR THE COLOR COMPUTER

Computer Systems Consultants **SUPER SLEUTH** is a "Time Tested", reliable, **PROVEN** Disassembler that has gained acceptance through out the FLEX Community as an extremely POWERFUL, **INTERACTIVE**, Software Tool. Now, this powerful Disassembler has been converted to run on a **Standard 32K Color Computer** or TDP-100 System with a **Disk System**. The CoCo **SLEUTH** Software Package consists of 3 Programs: SLEUTH (the Disassembler), CHGNAM (used to globally Change Labels to a meaningful Name), and XREF (a Cross Reference Generator for Source Code Files). CoCo SLEUTH will Disassemble Disk Files of 6800, 6801, 6802, 6803 (the "Baby CoCo"), 6805, 6808, 6809, and 6502 (Apple, Atari, Commodore, etc.) Object Code if you can get it on a Color Computer Disk. (See Aug. '83 '68' Micro Journal "Color Users Notes" Column for a full Review.)
Color Computer Disk - Object Code Only $49.00

FORTH Programming Language

Stearns Electronics FORTH -- Intrigued by Forth??? Here is a Forth package **tailored** to the **Color Computer!** This package is supplied on Tape, with instructions for transferring it to disk if you wish. Written primarily in machine language, it's **speed is unparalled**. A full Semigraphic-8 Editor is provided, along with "goodies" like Graphics and Sound Commands, Printer Commands, Auto-Repeat and Control Keys, etc. If you are interested in Learning Forth, a **Trace Feature** is provided which is invaluable. If you are a FORTH Pro, this package provides CPU carry Flag accessibility, Fast Task Multiplexing, Clean Interrupt Handling, etc. (Or; you won't "out grow" the Basic capabilities of this Implementation). Combine this package with Leo Brodie's EXCELLENT Book "Starting FORTH", and you will be a FORTH Expert before you know it (and have a lot of fun doing it!).

Color Computer TAPE (w/ instructions for transferring to Disk) $50.95

Color Computer **GRAPHIC SCREEN PRINT** Programs

Dumps any "PMODE" Screen to the Printer with the BASIC USR Function. Shift the Printout Left or Right or Reverse Print (Dark for Light Screen and Vice Versa). All Programs on Tape.

GSPR for Radio Shack LP-VII/VIII & DMP 100/200/400 Printers	$7.95
GSPRE for Epson w/ Graftrax and Graftrax + Printers	9.95
GSPRG for Gemini 10 and 15 Printers	9.95
GSPRP for the Prowriter Printers	9.95

DATE-O-BASE CALENDAR Program

A Menu Driven **EXTENDED BASIC** Program which allows the entry of up to 12 Memos per Day, each of which may contain up to 28 Characters, for any day of the Month between the years 1700 and 2099. A **Graphic Calendar** shows which days contain Memos, and a "Key Word" Search is provided which can be output to the Screen or Printer.

TAPE DATE-O-BASE CALENDAR (Each Tape File will hold up to 400 Memos) $16.95
DISK DATE-P-BASE CALENDAR (4,000 Memos at 300/Month per Disk) 19.95

Interested in **INTEREST** (the Money Kind)?

An **EXTENDED BASIC** Program that will help you deal with numerous problems requiring interest calculations. Present Value, Rate of Return, Current Bond Yield and Rate of Return to maturity, Loan Repayment Amortization Scheduals, etc.
TAPE $29.95

Data Base Management System

DISK DATA HANDLER 64K - EXTENDED BASIC w/ Mach. Lang. Routines. Allows a max of 246 Chars. and 14 Fields per Record, and another Record can be linked to the first; 8 Char. Field Names, up to 99 Chars. per Field. Powerful On-Screen editor for input and update, flexible Output capabilities including output to Disk Files for use by other Programs. Change File Definition without re-entering the Data, Split Files, etc. Allows Multiple Field Sorts, Select on any combination of Fields, etc. An extremely POWERFUL **TOOL**; instructions provide examples of Mailing Lists and a Financial Stock Profit and Loss Tracking System. **DISK** $54.95

ACCOUNTING

DISK DOUBLE ENTRY - DISK EXTENDED BASIC w/ Mach. Lang. Routines. A "Traditional" Accounting Package for Small Business, Clubs, Churches, Personal Use, etc. Up to four levels of subtotals with Trial Balance, Income Statement, and Balance Sheet Reports. DDE allows up to 300 accounts and a Trial Balance of $9,999,999.99. Transactions may be up to 14 lines long, and comments and explanations may be freely used. Accounts are traceable to the journal transaction, which may include comments. Screen reports allow review of past transactions and current balances. **DISK** $44.95

---- A full, screen oriented, **WORD PROCESSOR** ----

STYLOGRAPH 2.0 -- (now runs on the **Data-Comp** and **PHL Color FLEX** Systems; uses the 51 x 24 Display Screens). Full screen display and editing (i.e., what you see is what you get); supports the Daisy Wheel proportional printers.
SPECIAL Color FLEX STYLO $195.00; **FLEX** and **OS-9** STYLO $295.00; **UniFLEX** STYLO $395.00

Fast **SPELLING CHECKER** — allows directly changing the Text File, adding words to the dictionary, etc. 75,000 words in less than 400 sectors. **FLEX, Color FLEX, OS/9** $125.00 **UniFLEX** $175.00

MAIL MERGE — greatly extends the power and flexibility of STYLOGRAPH. Allows Multiple Text files to be printed out as one large document. Provides for merging information into the Text File during printing (such as different names and addresses), etc.
FLEX, Color FLEX, OS-9 $145.00 **UniFLEX** $195.00

INFOMAG Data Base Management System -- An XBASIC-based, Menu Driven, DBMS with "Built-In" Audit Tracking, Extremely Powerful Report & Format Capabilities, etc.. This **Time Proven** DBMS will become the "Work Horse" of your Software Stable.
FLEX and **Color FLEX** $295.00 **UniFLEX** $395.00

Accts Rec., Accts Payable & Gen Ledger -- A **FULL Accounting Package** that can be used together, or as separate packages; provides the IRS required Audit Tracking. (XBASIC, based on the "Osborne Business Programs.")
FLEX and Color FLEX $295.00/PROG UniFLEX $395.00/PROG

An **Electronic Spread Sheet**

DYNACALC — **THE Electronic Spread Sheet** for 6809 Computer Systems. An extremely POWERFUL Business Tool, this Program will find an unlimited number of "non-business" applications, also (for example, I have just finished setting up a Full Junior College Electronics Curriculum using **DYNACALC**). Advanced features like "Table Lookup" make Income Tax work easy; Column or Row Sorting for numerous applications; etc. Completely "Memory Resident", Machine Language, this Program is **FAST**. Provides STANDARD FLEX Text File output for use with BASIC, Word Processors, Pascal, "C", etc.
FLEX and **SPECIAL Color FLEX** (Both PHL and Data-Comp) $200.00 **UniFLEX** $395.00

Machine Language DATA BASE MANAGEMENT System

Westchester Applied Business Systems **XDMS** Data Management Systems. Possibly one of the most powerful DMS's available, this machine language program is small enough to operate on a **single sided 5" disk**, yet provides the speed of M.L. and power limited only by the user's imagination. Supports Sequential, Hierarchial, and Random Access File Structures, and has Virtual Memory capabilities for those Giant Data Bases. Easy-to-use English Language Command Structure.
XDMS — **FLEX** and **Color FLEX** $179.95 XDMS + — **FLEX** and **Color FLEX** $250.00

UNIVERSAL DATA RESEARCH INC. --- Note: **ALL** Accounting and DBM Progs. **Require** FLEX and XBASIC
These are Time Tested programs from an old, established, software house; for **Color FLEX** Systems
Data Base Manager Part 1 - $40.95; **Data Base Manager Part 2** - $49.95
Church Contributions - $49.95 **Single Entry Gen Ledger** - $49.95 **Balanced Billing System** - $49.95

Intergrated Software for **Color FLEX**
A/C $99.95 **A/P** $99.95 **Gen Ledger** $109.00 **Inventory 2** $69.00 **Payroll** $99.95

FLEX and **UniFLEX** — Note: Requires **XBASIC** (FLEX) or **basic** (UniFLEX)

A/C	FLEX $295	UniFLEX $395	**A/R**	FLEX $295	UniFLEX $395
Gen Ledger	FLEX $295	UniFLEX $395	**Inventory 2**	FLEX $295	UniFLEX $395
Payroll	FLEX $295	UniFLEX $395	**DBM**	FLEX $350	UniFLEX $450

Please specify 5 or 8 inch disk when ordering all software!

Computer Systems Consultants **FLEX XBASIC** Programs

FULL SCREEN FORMS DISPLAY	**FLEX** and **Color FLEX** $50.00	**UniFLEX** $75.00
FULL SCREEN MAILING LIST	**FLEX** and **Color FLEX** $100.00	**UniFLEX** $110.00
FULL SCREEN INVENTORY/MRP	**FLEX** and **Color FLEX** $100.00	**UniFLEX** $150.00
TABULA RASA SPREADSHEET	**FLEX** and **Color FLEX** $100.00	**UniFLEX** $200.00

SPELLB "Computer Dictionary" ---- **OVER 120,000 words!**

No more "Let your fingers do the walking through the Dictionary" while you are inputting Text with your favorite Editor or Word Processor. **SPELLB** is more than "another Spelling Checker"; it allows you to **look up a word** from within your Editor or Word Processor so that you **KNOW** it is right WHEN YOU TYPE IT IN with the **SPB.CMD** Utility (which operates in the FLEX Utility Space). Yes, it ALSO allows you to check and update the Text after you are finished; along with allowing you to ADD WORDS to the Dictionary, "Flag" questionable words in the Text for evaluation later, "View a word in context" before changing or ignoring, etc. **SPELLB** first checks a "Common Word Dictionary", then the normal Dictionary, then a "Personal Word List", and finally, any "Special Word List" you may have specified. **SPELLB** also allows the use of **Small Disk Storage** systems.

FLEX and **Color FLEX** $129.95

JUST --- a Text Formatter

JUST, a Text Formatter developed by Ron Anderson, provides numerous features which make it a valuable addition to any FLEX Users Software Library. **JUST** is designed for formatting Text Output for **Dot Matrix Printers** and provides many unique features:

-Output the "Formatted" Text to the Display for format analysis and change.
-Output the "Formatted" Text to a Text File for use with the **supplied PPRINT.CMD** for producing multiple copies of the Text on the Printer INCLUDING IMBEDDED PRINTER COMMANDS (this Utility is very useful at other times also, and worth the price of the program by itself).
-"**User Configurable**" for adapting to other Printers (comes set up for Epson MX-80 with Graftrax); provides for up to ten (10) imbedded "Printer Control Commands", such as Italics on and off, boldface on and off, etc.
-Automatic compensation for a "Double Width" printed line.
-Includes the normal line width, margin, indent, paragraph, space, vertical skip lines, page length, page numbering, centering, fill, justification, etc.
-Use with **ANY** Editor.
-Supplied with "Structured Source" (Windrush PL/9); easy to see the flow of the program.

FLEX and **Color FLEX** $49.95

SPECIAL!! SPECIAL!! SPECIAL!!

Star-Kits excellent **SPELL'N FIX Dictionary** and **WRITE 'N SPELL** Word Look Up Program IN ONE PACKAGE;
FLEX and **Color FLEX** Systems ---- **BOTH for ONLY $150.00**
When these are gone; the price goes UP!! WAY UP!! ORDER NOW!!

Also, call for "More Info" on both the FLEX Based and Color Computer Based **STAR-Kits** Products; including the HUMBUG Monitor, Check 'N Tax Program, REMOTERM Color Computer External Terminal Program, etc.

PASCAL UTILITIES — **Requires LUCIDATA Pascal ver 3.**

XREF -- produce a Cross Reference Listing of any text; oriented to Pascal Source.
INCLUDE — allows the inclusion of other Files in a Source Text; has unlimited nesting capabilities. Also allows Binary File inclusions.
PROFILER -- produces an Indented, Numbered, "Structogram" of a Pascal Source Text File. Allows viewing the overall structure of large programs, and provides clues as to the integrity of the program. Supplied as Source Code; requires compilation.

FLEX and **Color FLEX** — Each program $25.00

COPYCAT -- (Pascal **NOT** required) Allows reading TSC Mini-FLEX, SSB DOS68, and Digital Research CP/M Disks while operating under FLEX 1.0, FLEX 2.0, or FLEX 9.0 with 6800 or 6809 Systems. COPYCAT will not perform Miracles, but, between the program and the manual, you stand a good chance of accomplishing a transfer. Includes Utilities to List Directories, Copy Files, and convert Text Files when required. Also includes a Utility for investigating Physical Compatibility problems. Programs supplied in **Modular Source Code** to make it easier to solve unusual problems.
FLEX and **Color FLEX** 5" $50.00 **FLEX** 8" $65.00

O-F ---- OS/9 to **FLEX** - **FLEX** to OS/9 ----

Finally; the barrier has been removed between OS/9 and **FLEX** formatted disks! Now you can READ **from**, and **WRITE** to, a Single Sided 5" or 8" FLEX diskette from OS-9 with O-F. O-F is a new and unique program, written in **BASIC09** (**with Source**), that performs the following functions;

REFORMAT: A **BASIC09** Program that reformats a chosen amount of an OS-9 disk to **FLEX** Format so it can be used normally by FLEX.
FLEX: A **BASIC09** Program that does the actual **read** or **write** function to the special **O-F Transfer Disk**, all selectable from a user-friendly menu. Functions provided include reading the FLEX Directory, Deleting FLEX Files, Copying both directions, etc. All selections are interactive and complete, including all necessary prompts to the operator.

FLEX users can read, write and use the special disk as any other FLEX disk, provided the FLEX directory is not allowed to continue beyond track zero (too many files).
FLEX and **Color FLEX** $79.95

COPYMULT.CMD --- Copy **LARGE** Disks to several **smaller** disks ---

The following FLEX utilities allow the backup of **ANY size disk** to any SMALLER size diskettes (Winchester to 8's or 5's, 8" to 5's, etc.). By simply inserting diskettes as requested by **COPYMULT**, a large disk system may be downloaded to your present floppy disk system, any size. No need to fiddle with directory deletions or any of the other tedious operations that must be done using the normal copy routines.

COPYMULT.CMD understands normal "copy" syntax and always keeps up with files already copied by maintaining directories for both host and receiving disk system, eliminating hours of tedious keyboard entries and other time consuming cleanup chores.
BACKUP.CMD is a special program that downloads "random" type files, any size.
RESTORE.CMD a special program to restructure copied "random" files for copying, or recopying back to the host system.
FREELINK.CMD a "bonus" utility that "relinks" the free chain of floppy or hard disk thereby eliminating fragmentation.
Completely documented source files included. **ALL 4 Programs** $99.50 (8" or 5")

CHESS 6809
Requires FLEX and DISPLAYS **On Any Type Terminal**

Features:

*Two display boards. *Change skill level. *Swap side. *Point scoring system.
*Four levels of play. *Solve Checkmate problems in 1-2-3-4 moves.
*Make move and swap sides. *Play white or black.

This is one of the **strongest** CHESS programs running on any microcomputer, estimated USCF Rating 1600+ (better than most 'club' players at higher levels).
FLEX and **Color FLEX** $79.95

DIET-TRAC Forecaster

DIET-TRAC Forecaster is an XBASIC program that plans a diet in terms of either calories and percentage of carbohydrates, proteins and fats (C P G%) or grams of Carbohydrate. Protein and Fat food exchanges of each of the six basic food groups (vegetable, bread, meat, skim milk, fruit and fat) for a specific individual.

Sex, Age, Height, Present Weight, Frame Size, Activity Level and Basal Metabolic Rate for normal individual are taken into account. Ideal weight and sustaining calories for any weight of the above individual are calculated. When a weight goal is given (either gain or loss), and a calorie plan is agreed upon between the computer and the individual, the number of days to reach the weight goal is projected. The starting and ending rate of weight loss is calculated, and a daily calendar with each day's weight for a 30-day period is printed.
FLEX - $59.95 **UniFLEX** - $89.95

XDATA ---- A **COMMUNICATION** Package for the **UniFLEX** Operating System ----

Allows **UniFLEX Based Systems** to Transmit and Receive files to and from other Computer Systems via Modem. Use with CP/M, Main Frames, other UniFLEX Systems, etc.
-- Verifies Transmission integrity using checksum or CRC
-- Automaticly Re-Transmits bad blocks
-- Transmits data in 128 byte blocks

UniFLEX $299.99

---- **DISASSEMBLERS** ----

Super Sleuth -- Powerful, INTERACTIVE, Disassembler; provides Hex/ASCII Screen Dump of Memory Blocks or Disk Files for easy Examine/Change, Area Definitions; X-REF Generator of Source Code; change Address Labels to Names; etc. **Disassembles** 6800/1/2/3/5/8/9 and 6502 Code.
Color FLEX Obj. Only $50.00, w/source $99.00; **FLEX** $99.00; **UniFLEX** $100.00; **OS-9** $101.00

DYNAMITE + -- An "easy to use" 6809 Disassembler for use w/ Disk Files, (will also disassemble 6800 Code). Develop a "Control File" of Area Definitions during successive **disassemblies**; X-Ref Source Files; replace Hex locations with Label Names; etc. Label Files provided for Mini-FLEX, FLEX2, FLEX9, Color Computer FLEX. **FLEX** and **Color FLEX** $100.00 **OS-9** $150.00 **UniFLEX** $300.00

---- **ASSEMBLERS** ----

TSC **Macro Assembler** — the FLEX **STANDARD** Assembler **FLEX** and **Color FLEX** $50.00
TSC **Reloc. Asmb./Link. Load.** — Need for many of the C and Pascal Comp. **FLEX & Color FLEX** $150.00

RMMAC -- **Relocating, Recursive-Macro Assembler** and **Linking Loader** for the 6809. Use either standard **Motorola** Format or **Special** Ed Smith Format. Supports Recursive Macros, Conditional Assembly, etc. Opt. X-Ref Listing; Includes a Small Line-oriented Editor as part of the Assembler. Greatly improved operating manual. **FLEX** and **Color FLEX** 6809 RMMAC w/Link and Editor $150.00 w/Source, add $50.00

OmegaSoft Relocatable Assembler and **Linking Loader** — 2-pass Reloc. Asmb; 2-pass Link. Load. Supports 6 Char. Labels, System Calls (SWI[x] PCB x), Expressions with Arith., Logic, and Shifts, etc.
#RALL1 **FLEX** and **Color FLEX** $125.00 (one year Maint. $50.00)

MACE -- (by Graham Trott) from **WINDRUSH MICRO SYSTEMS**. A combined Editor/Assembler designed to allow the Programmer to Enter, Edit, and Assemble Programs with a minimum of effort, w/o leaving the Program. **XMACE** is a **Cross Assembler** for the MC6800/1/3 and Hitachi HD6301 (CMOS 6801) with the same functions and features as MACE.
FLEX and **Color FLEX** - $98.00

---- A **UniFLEX** "basic" **De-Compiler** ----

DUB -- Re-Create a Source Listing from **UniFLEX** Compiled BASIC Programs. Easy to Use; works w/ **ALL** Versions of UniFLEX basic; Output to Disk or Term. Time **TESTED** and **PROVEN**; SOLID! **UniFLEX** $219.95

---- **COMPILERS** ----

PL/9 -- (by Graham Trott) from **WINDRUSH MICRO SYSTEMS**. A "Structured" **Assembly Language Editor/Compiler**/Debugger, all in **ONE PACKAGE**; provides a totally **INTERACTIVE** Program Development Cycle. The Compiler supports large Symbol Names, Variable Types, Pointers, Control Structures, Stack, A- ,B-, and D-Register manipulation, etc. The **Source** oriented Trace/Debugger provides Single Stepping, Breakpointing, etc. An excellent Software Development Tool for utilizing the power of the 6809.
FLEX and **Color FLEX** - $198.00

C -- (By James McCosh) from **WINDRUSH MICRO SYSTEMS**. SUPER C Compiler for the FLEX Operating System. Needs the TSC Relocating Assembler/Linking Loader for those "full blown" System Packages.
FLEX and **Color FLEX** - 295.00

Introl 6809 "C" Compiler; generates very efficient object code. Output "benchmarks" close to 10MHz 68000 in 8 Bit Operations; 1.5 times faster than a 4 MHz Z80 when using a 2MHz 6809 System (Re. p 43, "68" Micro Journal, May '83). Floats, etc. **FLEX, Color FLEX, OS/9** $375.00 **UniFLEX** $425.00

---- **PASCAL** ----

TSC **PASCAL** — Native Code Compiler (UCSD Oriented). **FLEX** and **Color FLEX** $200.00

Lucidata PASCAL — P-Code Compiler (ISO Standard). Designed especially for Microcomputer Systems; Run-time System checks available resources for each task, allowing operation on even minimal computer systems. Allows linkage to Assembler Code for maximum flexibility.
FLEX and **Color FLEX** 5" $190.00 **FLEX** 8" $205.00

OmegaSoft PASCAL -- For the **PROFESSIONAL**; ISO Based, Native Code Compiler. For Real-Time and Process Control applications. Use custom I/O devices in place of the Pascal INPUT and OUTPUT; Long Int. (32 Bit); Dynamic length strings; Interrupt Proccessing, ROM-able, PIC, Re-Entrant Code, etc. POTENT!! **Includes** Source for the Symbolic Debugger, Runtime, and several Utilities. Requires a "Motorola Compatible" Relocating Assembler and Linking Loader.
#PCS2 **FLEX** and **Color FLEX** $425.00 (one year Maint. $100)

DYNASHARE --- Multi-User, Multi-Tasking with **FLEX**

Southeast Media is now shipping DYNASHARE **FROM STOCK** - the multi-user, multi-tasking capability of **DYNASHARE** allows **FLEX** users the advantages of more sophisticated and time saving computer usage without having to buy or learn a new Language or Operating System syntax. **DYNASHARE**, as its name implies, allows true "time-sharing" operation under the popular FLEX operating system, and also allows each user to run two simultaneous jobs (multi-tasking); even on single-user systems. For example, while in EDIT, you can list another file or examine a directory. Or, you might look up an item in a Data Base while a Sort is in progress! **DYNASHARE** also provides some fringe benefits that will be greatly appreciated by FLEX users, including type-ahead, command line editing, and instant response to "escape".

DYNASHARE is the painless method! Use your existing Flex computer by simply adding 64K of RAM for each user. Fact is, you still use FLEX just like you always have! **DYNASHARE** is not intended as competition to UniFLEX. It does not improve on the speed of FLEX, and does not offer password protection or other niceties of a full-blown multi-user system. What **DYNASHARE does do** is give FLEX users a **low-cost way to use existing software in a multi-user, multi-tasking environment**, so your existing FLEX versions of BASIC, XBASIC, editors, assemblers, disassemblers, sort/merge packages, word processors, compilers, DYNACALC spread-sheet package, and so on are still good.

NOTE -- The **initial release** of DYNASHARE is for **SWTPC S/09** Computers, but versions will also be available for other popular extended-memory (up to **1024K**) systems, such as HELIX and GIMIX. A minimum of **128K** of **RAM** will be required with **ALL** versions. **DYNASHARE** requires **64k of RAM for each active task**; thus a 256k system could allow foreground-background operation on two terminals, or foreground-only operation on four terminals. **AVAILABLE NOW** from **SOUTHEAST MEDIA** --- $200.00

--- **AUTHORS - PROGRAMMERS** ------- **QUALITY SOFTWARE NEEDED** ---
FLEX - UniFLEX - OS/9 - Color Computer

For the past several months, we at the **Southeast Media Division** of **Computer Publishing, Inc.** (CPI), the parent company of **'68' MICRO JOURNAL** and **COLOR MICRO JOURNAL**, have debated expanding our software distribution business. Many other magazines have been doing so for years (in fact, MOST were in the Software Distribution Business **BEFORE** they began to publish a Magazine). Presently there are many fine examples of software that has been developed by YOU, our readers, that will never see the "light of day" due to the cost of Advertising and TIME and cost involved in the production, distribution, and Customer SUPPORT of that software unless SOMEONE, with enough exposure and the willingness to continually advertise, runs with the ball.

Software is the "backbone" for the REAL utilization of any Computer System, and ours are no exception! This has been no simple decision. While we realise that there could be some conflict with some of our advertisers, we ALSO hear a LOUD and CONTINUOUS cry for **HELP** from our Readers. From day one, the **foremost** concern of '68' MICRO JOURNAL has been it's **READERS**. Therefore, our **Southeast Media Division** will accept, for appraisal for possible Distribution, 6809 software; Games, Utilities, Software Development, Business Application Programs, etc.

In the past there has been too **much** software offered that was not quite ready. We will strive to eliminate that element. But, right up front, we tell you only that we will do our very best; nothing more. Also, we will strive to keep cost to a bare minimum, while securing for the author a fair return in royalty payments, promptly paid, and in customer support for his product.

Of course, we will expect, no -- **DEMAND**, that the author keep the product free of errors (bugs), and maintain it in a prompt and business like manner. Also we shall require that authors be willing to furnish 'source' for those programs that justify, by price and utility, inclusion of same. The lack of source code, properly commented, is a continual complaint we hear. Not all programs will be sold with source, but where necessary, we will insist that it be included.

In some instances the program may be small or short and not justify itself as a "single" sale product. In this event it will be combined with other like programs, and offered as a package. In that event, the royalties will be split between the various authors.

If you have software that you feel will qualify under this program, please contact one of the people below. **Remember**, if your software has any problems or "funnies" -- **GET IT STRAIGHT BEFORE YOU CONTACT US!** Also get your source code in proper shape and well commented; there is too much 99% code already drifting around.

If your software is **READY** contact: **Bob Nay**, Don Williams, or Tom Williams

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You have probably noticed that the same list of strings found in the Entry Routine is used in the SCAN Routine, but in a little different order, and at TAB(28) there is the same number that was generated for each entry by the N=N+1 in 2170. By using this number, you can edit entries from outside the program. This may seem inconvenient, at first, but it saves considerable memory and works quite well.

To Edit, you must first have the entry number. Use SCAN to find the bad entry, and write down the number to its right. Have the correct entry ready. Press <BREAK>. Now, if, for example, the check number should have been 1555 and the entry number was 123, type in NU$(123)="1555" and press <ENTER>. Or, if the amount should have been $234.00 and the entry number was 112 then type AM(112)=234.00 and press <ENTER>. Each string in Line 6500 can be used in this way.

The timing loops can be changed to suit your preference. I made them faster after I had used the program for a while. By increasing the number, you increase the pause between prints. If you change them, remember to put the highest number with the line for the slowest timing.

USING THE PROGRAM

One of the many reasons I had for doing my own program was that the inexpensive Bookkeeping Programs I had seen had no feature for job information, other than to make up a whole account for each job. If you have a lot of small jobs, this can be a pain. Not only does it waste memory, but it doesn't link with general categories well. Amounts are entered either to this account or that account, but not to both.

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The way **MICROBOOKS** is written, you can put information from ANY entry into at least two categories. And JOB could be changed to ITEM for more general applications. You can get figures from the same entry, even from the same amounts, for separate categories. For example, I can call for a total spent for materials, or for a total spent on one job. Even though the amounts are mixed, I can get both sets of information by using both descriptors.

Lets get a little more specific. My expenses include materials, labor, truck, tools, office, personal, charitable contributions, and taxes and licensing. Rather than use numbers which I find hard to remember, I use three letter abbreviations: MAT, LAB, TRU, TOO, OFF, DRA (for draw), CON and TAX. Job numbers start with J (J147 etc.) if it is an expense. I use an M prefix (for "M"oney in the bank) if it is income. (This actually makes another category of information to draw from.) You could have as many categories as you have entries if that is what you need.)

You have probably noticed that Listing 1 has Income Entry routines, but Listing 2 does not. This is another way to save memory. By using an "Account Descriptor" to distinguish between Income and Expense, the same routine can be used for both tasks.

Most of my data is Expense since a large deposit usually covers many small expenses. If your operation is sales oriented, you might have more income entries. JOB# could be changed to SALE#. To keep track of certain of my personal expenditures, which come from the "draw" account, I use fictitious job numbers so I can locate these non business items.

MICROBOOKS is user friendly in the sense that once you know what you are going to do, you can do it easily and quickly. I'm sure that someone knowledgable in setting up books could get more out of it than I can. It is somewhat similar to a Single Entry Ledger, with the account descriptors paralleling columns headings and the payee descriptor paralleling line headings. With these, and the added JOB parameter, you can develop considerable utility, but it does take imagination.

EXPERIMENTING

If the program is still too big to suit you, you can take out some more fat by altering some of the screen prompts, combining a few more lines, etc. Combining lines is a tedious process, but will remove a surprising amount from the size (it is a good idea to only compress ONE LINE at the time, then RUN the Program to see if you introduced any problems). I have reduced it to below 1700 bytes by continuing to work on it in these ways, and would be glad to hear from anyone who has made it smaller yet.

It was a little surprising to learn that renumbering it to 1 per line actually removes over 100 bytes. This is of little significance if you have 32K, but that 100 bytes equals 4 to 6 entries, which could make a difference in small memory. Use RENUM,(old first line number),1.

I have put Listing 2 plus a 1.7K version plus a 3.2K version with edit, tape merge, and a number of other bells, whistles and conveniences on a cassette. If you would like to have this, plus a fairly detailed documentation, send $10.00 to the author, c/o this Magazine.

Jim LaLone

LISTING 1

```
1 CLEAR4000' POBOOKS 28 4369
5 DIMNU$(200),DA$(200),PA$(200),
AM(200),JO$(200),AC$(200)
10 N=1
1000 '          MENU
1010 CLS:PRINT:PRINT
1020 PRINT"            SELECT ONE"
:PRINT:PRINT
1030 PRINT"       <1>   ENTER EXPE
NSES"
1040 PRINT"       <2>   ENTER INCO
ME"
1050 PRINT"       <3>   MONTH TOTA
LS"
1060 PRINT"       <4>   YEAR TOTAL
S"
1070 PRINT"       <5>   VIEW FILES
"
1080 PRINT:INPUT"        ENTER YOU
R SELECTION";F
1090 IFF<0ORF>5GOTO1000
1100 ON F GOTO 2000,3000,4000,50
00,6000
2000 '
2010 '       ENTER EXPENSES
2020 '
2030 '          SUB MENU
2040 '
2050 CLS:PRINT:PRINT"
CHOOSE ONE"
2060 PRINT:PRINT:PRINT:PRINT"
     <1> NEW FILES"
2070 PRINT:PRINT"          <2> EXT
END FILES"
2080 PRINT:PRINT:PRINT:PRINT:INP
UT"          YOUR SELECTION";A$
2090 IFA$="1"THEN2195
2100 IFA$="2"THEN2500
2110 IFA$<0ORA$>2THEN2050
2170 '
2180 '       ENTER EXPENSES
2190 '
2195 N=1
2200 CLS:PRINT" INPUT EXPENSES-P
RESS <XX> FOR   NUMBER?  WHEN FI
NISHED"
2210 PRINT" last entry was:"NU$(
N-1)
2220 INPUT" NUMBER";NU$(N)
2230 IFNU$(N)="XX"THEN2320
2240 INPUT" DATE";DA$(N)
2250 INPUT" PAYEE";PA$(N)
2260 INPUT" AMOUNT";AM(N)
2270 INPUT" JOB #";JO$(N)
2280 INPUT" ACCOUNT";AC$(N)
2290 INPUT" IS THIS CORRECT? <Y>
 OR <N>";A$
2300 IFA$="N"THEN2220
2310 N=N+1:GOTO2200
2320 PRINT" LOAD AND REWIND TAPE
"
2330 PRINT" PRESS RECORD"
2340 INPUT" PRESS <ENTER> TO CON
TINUE";R$
2350 OPEN"O",#-1,"EXPENSE"
2360 PRINT#-1,N
2370 FORJ=1TON
2380 PRINT#-1,NU$(J),DA$(J),PA$(
J),AM(J),JO$(J),AC$(J)
2390 NEXTJ:CLOSE#-1
2400 CLS:PRINT@233,"DATA IS STOR
ED":FORT=1TO1000:NEXTT
2410 GOTO1000
2500 '
2510 '    EXTEND EXPENSE FILES
2520 '
2530 CLS:PRINT"    TO EXTEND EXP
ENSE FILES"
```

```
2540 PRINT:PRINT:PRINT"  LOAD CA
SSETTE CONTAINING CUR    RENT FI
LES ENTERED TO DATE"
2550 PRINT:PRINT:PRINT"    REWIN
D TAPE-PRESS PLAY"
2560 PRINT:PRINT:INPUT"   PRESS
<ENTER> WHEN READY";R$
2570 '
2580 '        LOADING
2590 '
2600 CLS:PRINT@234,"LOADING DATA
"
2610 OPEN"I",#-1,"EXPENSE"
2620 INPUT#-1,N:FORJ=1TON
2630 INPUT#-1,NU$(J),DA$(J),PA$(
J),AM(J),JO$(J),AC$(J)
2640 NEXTJ:CLOSE#-1
2650 CLS:PRINT@233,"DATA IS LOAD
ED"
2660 FORT=1TO1000:NEXTT
2670 GOTO2200
3000 '
3010 '      ENTER INCOME
3020 '
3030 '         SUB MENU
3040 '
3050 CLS:PRINT:PRINT"
CHOOSE ONE"
3060 PRINT:PRINT:PRINT:PRINT"
     <1> NEW FILES"
3070 PRINT:PRINT"        <2> EXT
END FILES"
3080 PRINT:PRINT:PRINT:PRINT:INP
UT"       YOUR SELECTION";S$
3090 IFS$="1"THEN3195
3100 IFS$="2"THEN3500
3110 IFS$<0ORS$>2THEN3050
3170 '
3180 '       ENTER INCOME
3190 '
3195 N=1
3200 CLS:PRINT" INPUT INCOME-PRE
SS <XX> FOR     NUMBER?  WHEN FI
NISHED"
3210 PRINT" last entry was:"NU$(
N-1)
3220 INPUT" NUMBER";NU$(N)
3230 IFNU$(N)="XX"THEN3320
3240 INPUT" DATE";DA$(N)
3250 INPUT" PAYER";PA$(N)
3260 INPUT" AMOUNT";AM(N)
3270 INPUT" JOB #";JO$(N)
3280 INPUT" ACCOUNT";AC$(N)
3290 INPUT" IS THIS CORRECT? <Y>
 OR <N>";A$
3300 IFA$="N"THEN3220
3310 N=N+1:GOTO3200
3320 PRINT" LOAD AND REWIND TAPE
"
3330 PRINT" PRESS RECORD"
3340 INPUT" PRESS <ENTER> TO CON
TINUE";R$
3350 OPEN"O",#-1,"INCOME"
3360 PRINT#-1,N
3370 FORJ=1TON
3380 PRINT#-1,NU$(J),DA$(J),PA$(
J),AM(J),JO$(J),AC$(J)
3390 NEXTJ:CLOSE#-1
3400 CLS:PRINT@233,"DATA IS STOR
ED":FORT=1TO1000:NEXTT
3410 GOTO1000
3500 '
3510 '   EXTEND INCOME FILES
3520 '
3530 CLS:PRINT"    TO EXTEND INC
OME FILES"
3540 PRINT:PRINT:PRINT"  LOAD CA
SSETTE CONTAINING CUR    RENT FI
LES ENTERED TO DATE"
3550 PRINT:PRINT:PRINT"    REWIN
D TAPE-PRESS PLAY"
3560 PRINT:PRINT:INPUT"   PRESS
<ENTER> WHEN READY";R$
3570 '
3580 '        LOADING
3590 '
3600 CLS:PRINT@234,"LOADING DATA
"
3610 OPEN"I",#-1,"INCOME"
3620 INPUT#-1,N:FORJ=1TON
3630 INPUT#-1,NU$(J),DA$(J),PA$(
J),AM(J),JO$(J),AC$(J)
3640 NEXTJ:CLOSE#-1
3650 CLS:PRINT@233,"DATA IS LOAD
ED"
3660 FORT=1TO1000:NEXTT
3670 GOTO3200
4000 '   MONTH TOTALS
4100 CLS:T=0:PRINT:INPUT"  NAME
ACCOUNT TO BE TOTALED       ";B$
4110 CLS:PRINT:PRINT:PRINT:PRINT
"     REWIND TAPE-PRESS PLAY"
4120 PRINT:PRINT:PRINT:INPUT"
 PRESS <ENTER> WHEN READY";R$
4130 CLS:PRINT@236,"SCANNING"
4140 OPEN"I",#-1,"EXPENSE"
4150 INPUT#-1,N:FORJ=1TON
4155 INPUT#-1,NU$(J),DA$(J),PA$(
J),AM(J),JO$(J),AC$(J)
4160 NEXTJ:CLOSE#-1
4165 FORJ=1TON
4170 IF B$=AC$(J) THEN T=T+AM(J)
 ELSE IF B$=JO$(J) THEN T=T+AM(J
)
4175 NEXTJ
4200 CLS:PRINT:PRINT:PRINT"    T
OTAL SPENT ON JOB# "B$,"    IS $
"T
4210 PRINT:PRINT:PRINT:PRINT:PRI
NT:PRINT:INPUT"   PRESS <ENTER>
FOR MENU";R$
4220 CLS:GOTO1000
5000 CLS:INPUT"        NOT P
ROGRAMMED YET            PRESS <
ENTER> FOR MENU";R$:GOTO1000
6000 '    INPUT DATA
6010 CLS:PRINT:PRINT:PRINT:PRINT
"     REWIND TAPE-PRESS PLAY"
6020 PRINT:PRINT:PRINT:INPUT"
PRESS <ENTER> WHEN READY";R$
6030 CLS:PRINT@234,"LOADING DATA
"
6040 OPEN"I",#-1,"EXPENSE"
6050 INPUT#-1,N:FORJ=1TON
6060 INPUT#-1,NU$(J),DA$(J),PA$(
J),AM(J),JO$(J),AC$(J)
6070 NEXTJ:CLOSE#-1
6080 CLS:PRINT:PRINT"  SCREENING
 SPEEDS-CHOOSE ONE"
6090 PRINT:PRINT:PRINT:PRINT"
     <1>  LOW SPEED"
6095 PRINT:PRINT"          <2>  H
IGH SPEED"
6110 PRINT:PRINT:INPUT"
YOUR SELECTION";S
6120 ON S GOTO6130,6190
6130 CLS:FORJ=1TON
6140 PRINT:PRINT NU$(J);TAB(8)DA
$(J);TAB(17)PA$(J):PRINTAM(J);TA
B(8)"JOB#"JO$(J);TAB(17)AC$(J)
6150 FORT=1TO300:NEXTT
6160 NEXTJ
6170 INPUT"    PRESS <ENTER> FOR
 MENU";R$
6180 GOTO1000
6190 CLS:FORJ=1TON
6200 PRINT:PRINTNU$(J);TAB(8)DA$
(J);TAB(17)PA$(J):PRINTAM(J);TAB
(8)"JOB# "JO$(J);TAB(17)AC$(J)
6210 FORT=1TO100:NEXTT
6220 NEXTJ
6230 INPUT"      PRESS <ENTER> F
OR MENU";M$
6240 GOTO1000
```

LISTING 2

```
4 CLS
5 PRINT"      MICROBOOKS
             BY  JIM LALONE"
6 '
7 FORT=1TO2000:NEXT
10 CLEAR5000:DIMNU$(230),DA$(230
),PA$(230),AM(230),JO$(230),AC$(
230):N=1:T=0
1000 GOSUB6000:PRINT@136,"<1> LE
DGER":PRINT@168,"<2> TOTALS":PRI
NT@200,"<3> SCAN FILES":PRINT@23
2,"<4> UNASSIGNED":PRINT@327,;:I
```

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Many have purchased compilers and then discovered that the particular compiler purchased either is not the most efficient for their purposes or does not contain features necessary for their application. Thus the added expense of purchasing additional compiler(s) or not being able to fully utilize the advantages of high level language compilers becomes too expensive.

The following COMPILERS are reviewed initially, more will be reviewed, compared and bench-marked as they become available to the author:

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```
NPUT"YOUR SELECTION";S:IFS<1ORS>
4THEN1000
1010 ONS GOTO2000,3000,4000,5000
2000 GOSUB6000:PRINT@168,"<1> NE
W FILES":PRINT@232,"<2> EXTEND F
ILES":GOSUB6100:IFS$="1"THEN2100
2010 IFS$="2"THEN2020ELSE2000
2020 GOSUB6800:IFA$="Y"THEN2100
2030 IFA$="N"THEN2400ELSE2020
2100 CLS:PRINT" INPUT ENTRIES -
WHEN FINISHED   REPLY <XX> TO <N
UMBER?>":IFS$="1"THEN2105ELSE:PR
INT" last entries: "NU$(N-2)" &
"NU$(N-1):GOTO2110
2105 S$="":PRINT
2110 INPUT" NUMBER";NU$(N):IFNU$
(N)="XX"THEN2180
2120 INPUT" DATE";DA$(N):IFDA$(N
)="CC"THEN2110
2130 INPUT" PAYEE/ER";PA$(N):IFP
A$(N)="CC"THEN2110
2140 INPUT" AMOUNT";AM(N):INPUT"
 JOB#";JO$(N):INPUT" ACCOUNT";AC
$(N):INPUT" IS THIS CORRECT? <Y/
N>";A$:IFA$="N"THEN2110
2170 N=N+1:GOTO2100
2180 CLS:PRINT@129,;:INPUT"HOW M
ANY SAVES";SA:IFSA=0THEN1000ELSE
PRINT@225,"LOAD AND REWIND TAPE"
:PRINT@289,"PRESS RECORD":PRINT:
INPUT" PRESS <ENTER> TO CONTINUE
";R$
2300 CLS:FORV=1TOSA:PRINT@233,"S
TORING DATA":OPEN"O",#-1,"LEDGER
":PRINT#-1,N:FORX=1TON:PRINT#-1,
NU$(X),DA$(X),PA$(X),AM(X),JO$(X
),AC$(X):NEXTX:CLOSE#-1:FORT=1TO
1500:NEXTT,V:CLS:PRINT@233,"DATA
 IS STORED":FORT=1TO900:NEXTT:GO
TO1000
2400 REM  EXTEND LEDGER
2420 CLS:PRINT@4,"TO EXTEND LEDG
ER FILES":PRINT@97,"LOAD CASSETT
E CONTAINING FILES  ENTERED TO D
ATE":GOSUB6200:GOTO2100
3000 REM  TOTALS
3010 GOSUB6000:PRINT@104,"<1> SU
B TOTALS":PRINT@168,"<2> BALANCE
 SHEET":PRINT@232,"<3> UNASSIGNE
D":PRINT:PRINT:GOSUB6100:IFS$="1
"THEN3100
3020 IFS$="2"THEN3200
3030 IFS$="3"THEN3300ELSE3010
3100 GOSUB6800:IFA$="Y"THEN3130
3110 IFA$="N"THEN3120ELSE3100
3120 CLS:PRINT@33,"LOAD CASSETTE
 CONTAINING FILES  TO BE TOTALED
":GOSUB6200:CLS
3130 T=0:INPUT" JOB OR ACCOUNT";
B$:IFB$="END"THEN1000ELSE:FORX=1
TON:IFB$=AC$(X)THENT=T+AM(X)ELSE
IFB$=JO$(X)THENT=T+AM(X)
3140 NEXTX:PRINT" TOTAL IN "B$"
IS:  ";:PRINTUSING"$$####.##";T:
GOTO3130
3200 GOTO6300
3300 GOTO6300
4000 REM  SCAN FILES
4020 GOSUB6800:IFA$="Y"THEN4050
4030 IFA$="N"THEN4040ELSE4020
4040 CLS:PRINT"    LOAD TAPE TO
BE SCANNED":PRINT:GOSUB6200
4050 CLS:GOSUB6000:PRINT@169,"<1
> SLOW SCAN":PRINT@233,"<2> FAST
 SCAN":GOSUB6100:IFS$="1"THEN407
0
4060 IFS$="2"THEN4080ELSE4050
4070 CLS:FORX=1TON:FORT=1TO170:N
EXTT:GOSUB6500:NEXTX:GOTO6600
4080 CLS:FORX=1TON:FORT=1TO80:NE
XTT:GOSUB6500:NEXTX:GOTO6600
5000 GOTO6300
6000 CLS:PRINT@75,"SELECT ONE":R
ETURN
6100 PRINT@360,;:INPUT"YOUR SELE
CTION";S$:RETURN
6200 PRINT:PRINT:PRINT"    REWIN
D TAPE-PRESS PLAY":PRINT:PRINT:I
NPUT"   PRESS <ENTER> WHEN READY
";R$:CLS:PRINT@233,"LOADING DATA
":OPEN"I",#-1,"LEDGER":INPUT#-1,
N:FORX=1TON:INPUT#-1,NU$(X),DA$(
X),PA$(X),AM(X),JO$(X),AC$(X):NE
XTX
6210 CLOSE#-1:CLS:PRINT@233,"DAT
A LOADED":RETURN
6300 CLS:PRINT" NOT PROGRAMMED":
FORT=1TO900:NEXT:GOTO1000
6500 PRINT:PRINTTAB(1)NU$(X);TAB
(8);:PRINTUSING"####.##";AM(X);:
PRINTTAB(17)PA$(X):PRINTTAB(1)DA
$(X);TAB(12)AC$(X);TAB(17)"JOB#
"JO$(X);TAB(28)X:RETURN
6600 PRINT:INPUT"    ANOTHER SCA
N?   <Y/N>";S$:IFS$="Y"THEN4060
6610 IFS$="N"THEN1000ELSE6600
6800 CLS:PRINT@228,;:INPUT"IS TA
PE LOADED?   <Y/N>";A$:RETURN
```

LANDER *GAME*

4K LANDER GAME

Hey 4Ker, tired of all the CoCo articles requiring 16K or more? Well, here's a Lunar Lander type game that uses Color Basic and only about 2K, so it should run on your machine.

The game has five difficulty levels which determine the size of the landing pad, the amount of fuel on board, and partially determines the strength of the gravitational field. The landscape changes each time you play, and the ship will appear at a different location, but will always be in the upper half of the screen. The ship will have random vertical and horizontal motion when first appearing. It is controlled using the Left and Right Arrow Keys for sideways motion and Number Keys one to four for vertical rocket thrust. You must guide the ship to a safe landing on the blue pad. To do this, the ship must not be moving any faster than five units down and one unit sideways, in either direction.

Now let us examine the listing. Line 3 has the POKE 65495,0 speedup command. If your computer cannot handle it, omit this line. Line 6 lets you input the difficulty level. Note that one is hardest while five is easiest.

Lines 12-63 draw the landscape and landing pad. Line 12 produces a random number that determines where the pad will be placed. Lines 15-18 set some variables to zero allowing the game to replay without having to restart. Lines 21-24 determine how long and high any ground feature will be. Lines 30-36 set the ground layer and lines 39-42 build it up to make a triangle shape. Note that these are variables, so you may get some strange shapes (what do you expect on an unknown planet, anyway!).

Line 45 sets the location for the next ground feature and line 48 checks to see if it is time for the pad to be drawn, or if it has already been drawn as controlled by the J variable. If the pad has been drawn or, it is not yet time for it, line 51 sends the program back to draw the next ground feature. Otherwise lines 54-63 draw the landing pad. Line 54 and 58 control the size of the landing pad.

Lines 66-69 pick the random location for the ship. Line 72 determines how strong the gravity field will be. Line 75 determines the amount of fuel you get, which ranges from 250 to 450 units.

Lines 78-81 picks random side and downward motions for the ship. If SV is negative, the ship moves left; positive and it moves right. If SV equals six, it will have no side motion.

Line 84 draws the ship the first time it appears. Afterwards, the ship is controlled via the keyboard. This is done in a loop that starts at line 87, where the ship's downward velocity is increased by the gravity field divided by three. Do not ask why I used this particular formula, it just seemed to work out nicely.

Line 90 will skip over your keyboard control if you have used all your fuel, but the graphics will be continued until the bitter end.

Lines 93-102 are the sub loop that checks keys one to four. By using the PEEK command, the keys can be held down for continuous engine thrust. Line 99 checks which key, if any is pressed, and makes the value of BX equal to BU, which is the rocket burn.

Lines 108-111 use the PEEK command to check on the arrow keys and make the adjustments to the side velocity. They also have a sound effect and use fuel.

Line 114 figures out your vertical velocity status if the main engine has been fired. Note that the burn factor remains constant for each key, but its effect is determined by the strength of the gravity field. As the field gets stronger or weaker, the burn will have less or more effect.

The altitude readout is determined by the Y, or height component, of the ship times ten. If the ship's height is less than 50, it is multiplied by two to make it look a little better. If the Y component reaches 28, the ship has hit bottom and crashed.

Line 123 adjusts the ship's vertical visual movement in accord with its velocity. Feel free to change the parameters, but remember you have less than 30 points to work with.

Lines 126-132 control the ship's sideways movements. Line 135 checks to see if the ship has reached either the top or sides of the screen. The ship's motion will continue unless you or gravity do something, but it will happen off screen as line 135 will make the program skip over the graphics until the ship is back within the screen's limits.

Line 138 actually draws the spaceship. Line 141 checks your fuel and sets it to zero if you burned it up in the last loop. Line 144 gives the readout of the various factors found at the bottom of the screen. F is fuel, A is altitude, S is sideways motion, V is vertical velocity, and G is gravity field strength. If V is negative, you are going up. Positive and you are coming down. When you land, S cannot be greater than plus or minus one and V cannot be greater than five.

Line 147 again checks to see if the ship is on or off the screen. If off, you loop back to 87 to start another cycle. If on, lines 150-167 check to see if you have hit the ground or landing pad. This is done by checking the color of the three points directly under the ship, and one on each side when it is above a certain height. If they register white, you have hit something. Below a certain height the three points under the ship are the only ones checked but with a difference. Instead of being immediately under, they are the next level down. I had to do this because of the way CoCo handles low resolution color blocks. In a four block square, each color has to be the same. What was happening was when the ship was one level above the pad, it would turn the pad yellow, matching its color. Since the computer was only looking for white and blue, it would take no action and the ship would continue down and through the pad. To prevent this, I adjusted the points to be checked so they would be in a different square than the ship. The ship now lands one level above the pad.

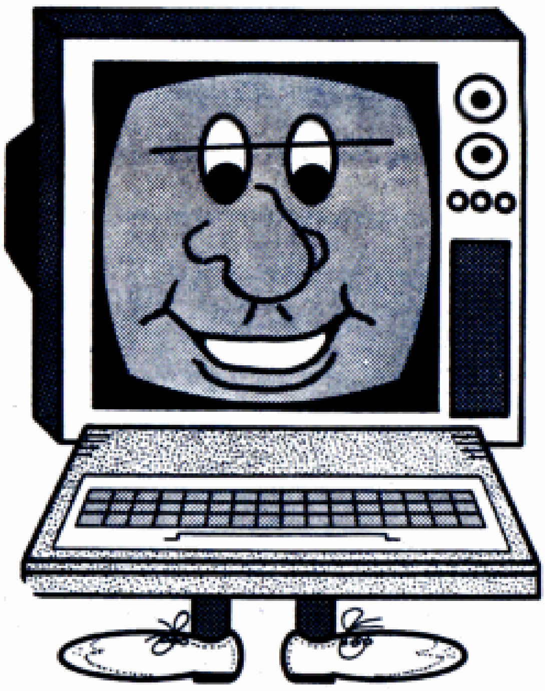
If the ship has not hit anything, or landed, line 168 resets the points so a new position can be displayed. Line 171 is used after the first time the ship is drawn so that the computer will accept keyboard inputs, and 174 sends the program back to start the loop over.

If you hit the ground, line 177 lets you know and 180-192 tells you what you did wrong. Lines 195-198 produce a sound effect and 201 moves you to the play again option.

If you did land on the pad, lines 204-207 make sure you were within the given parameters, and if not, sends you to line 177 to tell you that you blew it. Line 210 congratulates you if you did it right, and 213-216 produce a sound effect. Line 219 again asks if you want to play again. If you choose to play, you go back to line 6 and can choose a new level. You automatically get a new landscape. If you choose not to play, line 225 shuts off the high speed poke and ends the game.

That, in a cracked nutshell, sums it up. If you need a justification of what is going on, pretend you are trying to remote control ships to a safe landing after they have warped out of hyperspace. We all know how tricky hyperspace is, so over which planet, and where over it, and going in what direction is all left up to chance. In each ship is a cargo of gold, or arms, or gorgeous members of the opposite sex, or whatever you little heart lusts for. To reap the rewards, you must bring those little ships in safe and sound.

```
1 REM LANDER BY ROBERT TOSCANI
3 POKE65495,0
6 INPUT"LEVEL 1 HARD-5 EASY";H
9 CLS0
12 L=RND(42)
15 E=0:RT=0:J=0
18 F=0:G=0
21 B=RND(27):IF B<7THEN21OR IF E
>50 AND B<12THEN21
24 D=RND(28):IF D<14 OR D>27THEN
24
27 FOR C=29 TO D STEP-1
30 FOR A=E+F TO E+B-G
33 IF A>63THEN66
36 SET(A,C,5):NEXTA
39 F=F+1:G=G+1
42 NEXTC
```



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```
45 E=E+B
48 IF E>=L AND J=0THEN54
51 GOTO18
54 FOR K=1TO H+4
57 SET(E+K,29,3)
58 IF E+K=>63THEN63
60 NEXTK
63 E=E+K:J=1:GOTO18
66 M=RND(60):N=RND(11)
69 IF M<4 OR N<3 THEN66
72 GR=RND(12)-H:IF GR<=4THEN GR=
3
75 FU=200+H*50
78 SV=RND(11):IF SV<=5THEN SV=-S
V ELSE IF SV>6 THEN SV=SV-5 ELSE
 SV=0
81 VE=RND(30)
84 IF RT=0THEN138
87 BX=0:BU=0:VE=VE+INT(GR/3)
90 IF FU<=0THEN114
93 FOR PE=339 TO 342
96 BX=BX+BX+1
99 IF PEEK(PE)=239THEN BU=BX:SOU
ND90-(BU*2),1
102 NEXT PE
105 FU=FU-BU
108 IF PEEK(343)=247 THEN SV=SV-
1:SOUND100,1:FU=FU-1
111 IF PEEK(344)=247THEN SV=SV+1
:SOUND100,1:FU=FU-1
114 VE=INT(VE-BU*.5)
117 AL=(28-N)*10:IF AL<50 THEN A
L=(28-N)*2
120 IF N>27THEN177
123 IF VE>0 AND VE<20THEN N=N+1
ELSE IF VE>=20THEN N=N+2ELSE IF
VE<0 AND VE>-20THEN N=N-1ELSE IF
 VE<=-20THEN N=N-2
126 IF SV=0THEN S=0:GOTO135
129 S=INT(SV/2):IF S=0THEN S=1
132 M=M+S
135 IF M<=2 OR M>60 OR N<=0THEN1
44
138 SET(M-1,N+1,2):SET(M+1,N+1,2
):SET(M,N,2):SET(M+1,N+2,2):SET(
M,N+2,2):SET(M-1,N+2,2)
141 IF FU=<0THEN FU=0
144 PRINT@480,"F";FU;:PRINT@485,
" A";AL;:PRINT@492," S";SV;:PRIN
T@499," V";VE;:PRINT@504," G";GR
;
147 IF M<=2 OR M>60 OR N<=0THEN8
7
150 IF N=25THEN ZX=1ELSE ZX=0
153 IF N=25THEN CV=3ELSE CV=4
156 IF N=25THEN BN=4ELSE BN=3
159 FOR QW=ZX TO CV:ER=POINT(M-2
+QW,N+BN)
162 IF ER=5 THEN 177 ELSE IF ER=
3 THEN 204
165 NEXT QW
168 RESET(M-1,N+1):RESET(M+1,N+1
):RESET(M,N):RESET(M+1,N+2):RESE
T(M,N+2):RESET(M-1,N+2)
171 RT=1
174 GOTO87
177 PRINT@0,"CRASHED!";
180 IF VE>5AND AL<19THENPRINT" G
OING TOO FAST";
183 IF FU<=0THENPRINT" RAN OUT O
F FUEL";
186 IF AL>19THENPRINT" RAN RIGHT
 INTO IT";
189 IF AL<19AND ER=5THENPRINT" M
ISSED THE PAD";
192 IF SV<-1OR SV>1THENPRINT" TO
O MUCH SIDE MOTION"
195 FOR U=255TO 1 STEP-3
198 SOUND U,1:NEXTU
201 GOTO219
204 IF VE>5THEN 177
207 IF SV<-1OR SV>1THEN177
210 PRINT@0,"GREAT LANDING";
213 FOR U=1TO255 STEP5
216 SOUND U,1:NEXTU
219 PRINT" TRY AGAIN Y/N":INPUT
D$
222 IF D$="Y"THEN 6
225 POKE65494,0:END
```

Robert Toscani

THIS 'N THAT

Continued from page 1

gained an excellent reputation for the quality and support of their products. We will have a full review of the **RDC-1** next month, but, in the mean time, here are some of our initial findings.

F & D is primarily ONLY selling the PC Board and a 'special' chip (the FDC9216B), with instructions, for $49.95. The PC Board will have Gold Plated PC Lands for the Edge Connector, and the circuitry consists of only about two dozen parts, total, including 14 IC's and a Crystal, with **NO Adjustments**. It will take an experienced "Solderer" less than two hours to assemble the unit once he has the parts rounded up, and the layout is 'spacious', so the soldering is not at all tedious. Ours worked the first time we plugged it in. We used a standard Western Digital Controller Chip, and had NO problems with Radio Shack or FLEX, but was unable to format an OS-9 Disk due to a chip timing problem. A call to F & D, and some checking and discussions, led to the discovery that OS-9 works fine with the **Radio Shack supplied Disk Controller Chip**, but **NOT** with the standard WD Chip. Also, the **RDC-1** is designed to use either an F & D ROM (FADBUG-C, $25.00), OR the standard Radio Shack Disk BASIC ROM (about $35.00, depending on your source). So far, we are EXTREMELY pleased with this Color Computer Disk Controller.

'This Month'

It is the "Nature of the Beast" that MOST Color Computer Owners are **NEW** Computer Users, and therefore have MANY questions about much of the 'stuff' that many of us consider to be 'Old Hat'. Yet, there is also a HIGH percentage of CoCo Owners that are "mature" Computer Users; who understand Disk Systems, Assembly Language Programming, etc. With **Color Micro Journal**'s thrust towards **USABLE INFORMATION** for the Color Computer User, we must provide a broad coverage of material.

The large majority of CoCo Owners have, and are fairly familiar with, the Tape System and its operation, but the Disk Systems open up a whole new can of worms. We have an Article this month that should help those considering the purchase of a Disk System by answering some basic questions about Disk Systems, and especially the CoCo's.

For the BASIC Users, we offer a "Lander" type of Game for the 4K Owners, and a Small Business Bookkeeping System for the Tape Users. Finally, we have the first part of an Assembly Language "Linking Loader" System which can be Assembled for either Radio Shack DOS or the FLEX DOS. The Source Code, which is fairly lengthy, will be presented next month. With the Microcomputer systems moving more and more towards the "Large System" procedures of modularized structures, and the use of Relocating Assembler/Linking Loaders, we have oriented this Article towards both providing some background information on Linking Loaders, their use and operation, and then will provide the Program that will allow you to use the concepts in building up a "Library" of "Linkable Modules" which can be included in your Machine Language Programs as needed.

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HELP!

We are receiving more and more requests for "Hardware" INFORMATION and PROJECTS; Basic Digital Electronics, information on the "innards" of the CoCo such as the SAM Chip, PIAs, VDG, A/D and D/A conversions, the Memory Chips and Addressing Methods, Video Systems, Disk Controllers and Chips, etc. We also see a lot of interest for information about "adding more capability" to the Color Computer, such as a Hard Disk Interface, ACIA's, R-G-B conversions, etc. How about some of you "Hardware Hackers" giving us a call, or drop us a note. We are also receiving a lot of requests for "basic information"; BASIC Programs for 4K systems, Methods for using the Tape System for File Storage and Retrieval, etc., etc., etc.

CoCo POWER . . .

Some of us have been "preaching" about the power of the Radio Shack TRS-80C Color Computer since it first hit the streets, because we KNOW the capabilities of the 6809 CPU that resides under the cover of this Computer. While the Z80 Series CPU Chips are very good devices, they have been "out-dated" by what has been learned during the last 10 to 15 years of USING Microcomputers, and by the progression of Programming Methods over this same period of time. In the vast majority of cases, the Z80 has been strapped to the CPM Disk Operating System, which STILL restricts the Z80 to the old 8080 Instruction Sub-set, which makes NO use of some of the Z80's more powerful capabilities.

One of the most illuminating comparisons between the two CPU Chips can be found in the Operating Systems available for them. While probably 90% of the Assembly Language Programmers in the US has been working with the Z80 for better than 10 years, they are JUST **NOW** beginning to develop Multi-User, Multi-Tasking Operating Systems for that CPU (such as Oasis, Isis, Zenix, etc.). Less than a year after the 6809 hit the market, there were **TWO** good Multi-User, Multi-Tasking Operating Systems available for the it; **OS-9** and **UniFLEX**. Now, as I am sure most of you are aware, **OS-9** is running on the Color Computer.

Another indication of the power of the Color Computer is the number of them purchased by "Technical" people; especially those in the Space Industry. From the Engineers through the "Technicians", the Color Computer appears to be their primary choice.

While it is extremely powerful, it also has some limitations. The biggest limitation is the use of Software in providing the Serial Output and Keyboard Interface. This really shows up with the OS-9 Operating System, which much prefers to be "doing its own thing" rather than having to look through rows and columns for a key from the Keyboard, or "punch bits" through a PIA to provide a Serial Output. Even with this limitation, OS-9 still provides more inherent power in an Operating System than is available for any other Home Computer, and most Business Computers.

Overall, the Color Computer provides more **Power for the Dollar** than **ANY** other Computer available; Home or Business, Micro or Mainframe. No, the Color Computer will not replace the Business Computers, small or otherwise.

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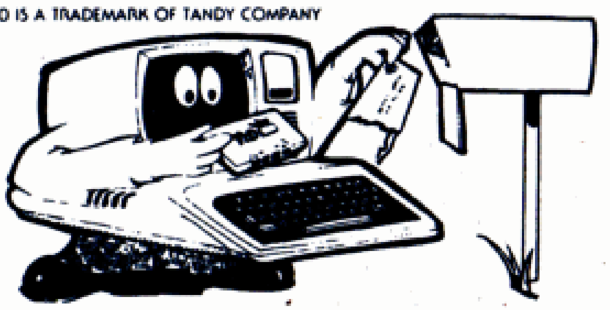

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The Color Computer's slot in the "scheme of things" is in the area of **EDUCATION.**

The first area of learning that the Color Computer fills is that of "Personal Computer Education". EVERYONE knows that "Computers" are the "wave of the future". They are appearing EVERYWHERE: on the job, in the home, in college; in household appliances, in cars, in the grocery store cashiers line, at the 'instant banker' location, in the drug store, in the auto repair shop, etc., etc. "John Doe" buys a "Personal Computer" just to keep from being left behind in the world he lives in. For around $300, he can begin to "learn about Computers", and for less than $2000 total, spread over a period of time, he can have a Computer System that provides an introduction to the use and operation of some of the most sophisticated and powerful Operating Systems in the World, along with the availability of equally powerful Programming Tools.

The other area of EDUCATION which can be fulfilled by the Color Computer is that of "Formal Education"; i.e., in the Schools. Here, even more than in the Home, COST is a major consideration. Again, the Color Computer is "untouchable" as far as capability versus cost is concerned. In the lower Grades, the combination of Color and Sound provides maximum attention span, and is EASY to Program on the CoCo. In the later Grades, the Color Computer provides the Advanced Operating Systems and Programming Languages that can allow a student to move into a College Situation and concentrate on CONCEPTS, rather than learning "how to use the Computer".

The major hold-up in the Color Computers emergence as a MAJOR Educational Tool is the shortage of **GOOD** Software. If you look at the emergence of Software for the comparable Computer Systems (i.e., Atari, Apple, Commodore - the little TI is not even in the same league), you will see that the first 'thrust' of the Software was towards Games. This happens for a couple of reasons: first, that is the "quick buck" Market and provides both the Computer Programmer and Computer User a means of becoming familiar with the machine; and, second, it allows Programmers to develop techniques and skills to be used as a basis for writing good 'Working' Software. We are now beginning to see some results from these experiences in some of the CoCo Software. All of this Software is applicable to the "Computer Education" area; i.e., the Computer User uses it to learn more about HIS Computer, and Computers in general.

The REAL lack of GOOD Software in is the "Formal Education" area. There are a few good programs, mostly in the below 7 year old area, but there the Software dies. Not only is this area weak on the Color Computer, but it is no better with **ANY** of the small Computers. The problem in not so much that the Software in not available; it is that the **BASIC CONCEPTS** are wrong! The use of the Computer in Formal Education requires DIFFERENT methods and concepts than the old, established, "book learning" methods. New techniques for instruction are required, along with new classroom concepts, different teaching methods, etc. How many of your childrens' schools "Have a Computer"?? Well, how many **USE JUST ONE TYPEWRITER** for a typing class? See what I mean. Not only that, but most school administrators can not even grasp the concept that a Program for an Apple will not run on a Color Computer. After all, a Computer is a Computer. Right?

Even though there is a REAL need for a MAJOR OVERHAUL in the Educational System, and the Computer appears to provide MANY of the answers, it will take a long time to overcome the inertia of the "present system". Most of you reading this can begin to make some inroads in these areas through work with School Groups, such as the PTA, by offering your "expertise", and RECOMMENDING the Radio Shack Color Computer. You can put a half dozen CoCos in a classroom for ONE Apple, and give up WHAT? Sure, there is a lot of Software for the Apple, but is it any better than the little bit avaliable for the CoCo? **NO!** In fact, as I mentioned earlier, there is very little VALID Software available for **ANY** of the computers. Most of the Computers in a School are used either to keep kids "out of the way", or as a "candy bar" for doing something right. **VERY SELDOM** is a Personal Computer put to any good use in a School. Think about YOUR situation, and let us know YOUR thoughts on the matter.

We will pursue this matter as time goes on. Again, let us know your thinking, whether you are a Parent, a Software Developer, a Teacher, or what ever; LETS HEAR FROM YOU!

--- RLN, Editor ---

GRAPHIC LETTERS

Here is a useful utility, **LETTERS**, that I wish you to consider for possible publication. I am 15 years old and I have owned my Color Computer for two and half years. I enjoy using the graphic and sound capabilities of the Color Computer, and I have written **LETTERS** to be an aid in doing so.

LETTERS is designed to provide text symbols on the graphic screen without the time-consuming chore of drawing each individual one. It is not designed to replace the text screen, but to make it easier to use labels and prompts for your hi-res games and graphic displays.

I have included in **LETTERS** almost all of the Keyboard Symbols available. The 26 letters correspond to a variable named the same as the letter. For example: to draw the letter 'A' type **DRAW AA$**. The letter 'X' would be XX$.

The numbers are drawn in a different way. For example: to draw the number '5' type **DRAW N$(5)**. The N stands for number and the number in parenthesis is the number you want to draw. The numbers range from 0 to 9. To draw a larger number such as '29' type **DRAW N$(2)+N$(9)**.

Here is a list of symbols that have more than one letter for a variable.

+	PLUS$
-	MINUS$
x (TIMES)	MULT$
DIVISION SIGN	DIVI$
=	EQUAL$
!	EXCLAIM$
"	QUOTE$
#	NUMBER$
$	DOLLAR$
'	APOS$
%	PRCENT$
(	LPAREN$
)	RPAREN$
-	DASH$
,	COMMA$
/	SLASH$
<	LTHAN$
>	GTHAN
;	SEMI$
:	CLON
?	QMARK$
UP ARROW	ARROW$
UNDERLINE	ULINE$
.	PERIOD$
SPACE	SP$

If you wanted to draw something on the graphic screen, here is an example of what you would enter:

```
 10 PMODE 4:PCLS:SCREEN 1,1
  20 DRAW "BM0,100"+LL$+EE$+TT$+TT
  $+EE$+RR$+SS$+SP$+SP$
  30 DRAW A$+DASH$+ZZ$+SP$+N$(1)+D
  ASH$+N$(9)
  40 GOTO 40
```

The result the graphic screen would look like this:

LETTERS A-Z 1-9

Here is a description of each line:

LINE 10: Sets the pmode, clears the graphic screen and sets the color mode. These can be whatever you want them to be. Of course, the symbols look best in PMODE 4, since it is the highest resolution.

LINE 20: Starts to DRAW at location 0, 100 on the graphic screen. The 0 is the horizontal coordinate, and 100 is the vertical coordinate. These can also be whatever you wish. Then it draws the word LETTERS and two spaces following it.

LINE 30: Draws the letters 'A-Z' and the numbers '1-9'

LINE 40: It keeps going back to itself, and it will keep the program in an endless loop to keep the graphics on the screen. It can be stopped by pressing the **BREAK** Key.

Be sure that there are no variables in your program that have the same variable names as the ones used in **LETTERS**. This will cause undesired results in your program. I have used double variables such as BB$ and ZZ$ to keep them from getting confused from variables such as B$ and Z$. On the longer variable names, such as EQUAL$, the computer only uses the first two letters - EQ$, so be sure no other variables in your program have even the first 2 letters of a variable the same. If you want to use shortened variables, that will work fine; I have used longer variables to keep the program organized.

Use **LETTERS** as a subroutine at the end of you program. The first or second line of your program should GOSUB to that routine and then RETURN. All the variables will be defined, and you will not need to go back to that routine again.

I hope **LETTERS** will make it easier to provide text on the graphic screen. Many times I have avoided putting text in my graphic programs because it was too difficult. It is now much easier with this utility. This program can be modified to suit you needs, or used as

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a sub-routine in your programs; even ones you wish to copyright. I just ask that you simply mention in REM statements, or in you title screen, where you took it from (this is standard procedure for any Published information - Editor). I hope you enjoy **LETTERS!**

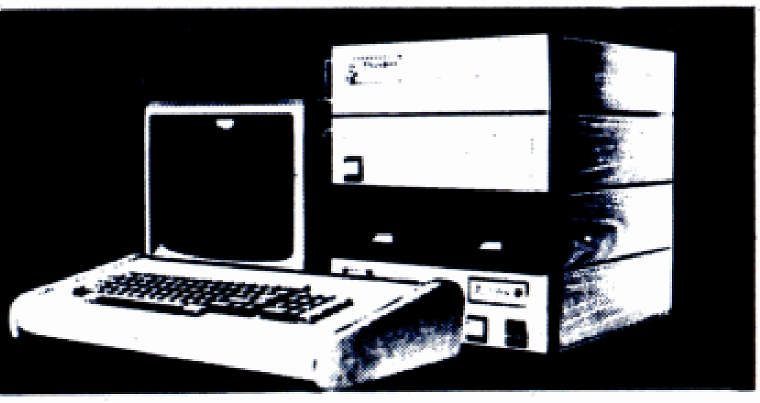
```
10 '***       LETTERS       ***
20 '***    BY PETER STUMPF   ***
50 CLEAR 1000
60 DIMN$(15)
70 GOSUB 2080
710 '***DRAW TITLE SCREEN***
720 PMODE4,1:PCLS:SCREEN1,1
730 GOSUB820:GOSUB940
740 SCREEN1,0:GOSUB940
750 PMODE3,1:PCLS:SCREEN1,1
760 GOSUB820:GOSUB940
770 SCREEN1,0:GOSUB940
780 PMODE1,1:PCLS:SCREEN1,1
790 GOSUB820:GOSUB940
800 SCREEN1,0
810 GOSUB940:GOTO720
820 DRAW"BM40,40S12"+LL$+EE$+TT$
+TT$+EE$+RR$+SS$
830 DRAW "BM44,40"+UL$+UL$+UL$+U
L$+UL$+UL$
840 DRAW"BM102,65S8"+BB$+YY$
850 DRAW"BM35,90"+PP$+EE$+TT$+EE
$+RR$+SP$+SS$+TT$+UU$+MM$+PP$+FF
$
860 DRAW"BM0,120"+AA$+BB$+CC$+DD
$+EE$+FF$+GG$+HH$+II$+JJ$+KK$+LL
$+MM$
870 DRAW NN$+OO$+PP$+QQ$+RR$
880 DRAW"BM0,140"+SS$+TT$+UU$+VV
$+WW$+XX$+YY$+ZZ$
890 DRAW EX$+QU$+NU$+DO$+PR$+AP$
+LP$+RP$+EQ$+DA$
900 DRAW"BM54,160"+AR$+PL$+SE$+C
L$+LT$+GT$+CO$+PE$+QM$+SL$
910 DRAW"BM50,180"+N$(1)+N$(2)+N
$(3)+N$(4)+N$(5)+N$(6)+N$(7)
920 DRAW N$(8)+N$(9)+N$(0)
930 RETURN
940 FORX=1TO1000:NEXT
950 RETURN
2070 '***INITILIZE LETTERS***
2080 SP$="BR9"
2090 AA$="BR3U4E2F2D2L4R4D2"
2100 BB$="BR3R3L3U6R3FDGL3R3FDGB
R"
2110 CC$="BR3BUFR3L3HU4ER3BD6"
2120 DD$="BR3R3L3U6R3FD4GBR"
2130 EE$="BR3R4L4U3R3L3U3R4BD6"
2140 FF$="BR3U3R3L3U3R4BD6BL"
2150 GG$="BR3BUFR2EUHLBL2D2U4ER3
BRBD6"
2160 HH$="BR3U6D3R4U3D6"
2170 II$="BR3R4L2U6L2R4BD6"
2180 JJ$="BR3BUFR2EU5BD6"
2190 KK$="BR3U6D3RE3G3F3"
2200 LL$="BR3BU6D6R4BL"
2210 MM$="BR3U6F2E2D6"
2220 NN$="BR3U6DF2F2DU6BD6"
2230 OO$="BR3BUU4ER2FD4GL2HFBR3"
2240 PP$="BR3U6R3FDGL2BD3BR3"
2250 QQ$="BR3BUU4ER2FD4GL2HFR2EH
F2BL"
2260 RR$="BR3U6R3FDGL3R2F2D"
2270 SS$="BR3BUFR2EUHL2HUER2FBD5
"

2280 TT$="BR3BU6R4L2D6BR2
2290 UU$="BR3BU6D5FR2EU5BD6"
2300 VV$="BR3BU6D2FD2FEU2EU2BD6"
2310 WW$="BR3BU6D6E2F2U6BD6"
2320 XX$="BR3UE4UBL4DF4D"
2330 YY$="BR3BU5UDF2E2UDG2D3BR"
2340 ZZ$="BR3BU6R4DG4D1R4
2350 '**INITILIZE OTHER SYMBOLS*
*

2360 PLUS$="BR5BUU4D2L2R4BRBD3"
2370 MINUS$="BR5BU3R4BD3
2380 MULT$="BR5BUE3BL3F3BLBDBR2"
2390 DIVI$="BR5BU3R4L2BUUBD3DBR2
BD1"
2400 EQUAL$="BR5BU3R4BUL4R4BD4"
2410 EXCLAIM$="BR3BR2UBU2U4BR2BD
6"
2420 QUOTE$="BR3BRBU4U2BR2D2BR2B
D6"
2430 NUMBER$="BR3BU2U4BR2D4URL4B
U2R4BD5BR2"
2440 DOLLAR$="BRBU2R4U2L4U2R4L2U
D6BR3BD"
2450 PRCENT$="BR3BU6DRUBR3G5BR3U
RDBRBD"
2460 APOS$="BR3BRBU6UDGBR3BD5"
2470 LPAREN$="BR5BUHU4EBR2BD6
2480 RPAREN$="BR5EU4HBR2BD6
2490 DASH$="BR3BU3R4BD3"
2500 COMMA$="BR3BRUDGBR3"
2510 PERIOD$="BR3UDBR4"
2520 SLASH$="BR3UEU2EUBD6
2530 LTHAN$="BR3BU3F3H3E3BD6BR"
2540 GTHAN$="BR3BR4BU3G3E3H3BD6B
R4"
2550 CLON$="BR3BRBUUBUUBD4BR2"
2560 SEMI$="BR3EUBUUBD4BR2"
2570 QMARK$="BR3BR2UBUU2REUHL2GB
D5BR4"
2580 ARROW$="BR3BR2U6G2R4H2BD6BR
2"
2590 ULINE$="BR0BD1R8BU1
2600 '***INITIALIZE NUMBERS***
2610 N$(1)="BR3BR2R4L2U6G2BD4BR3
"

2620 N$(2)="BR3R4L4U2E1R2E1U1H1L
2G1BD5BR4"
2630 N$(3)="BR3BU1F1R2E1U1H1L1R1
E1U1H1L2G1BD5BR4"
2640 N$(4)="BR6U6G3R4BD3"
2650 N$(5)="BR3BU1F1R2E1U1H1L2H1
U2R4BD6"
2660 N$(6)="BR2BUFR2EUHL2GDU4ER2
FBD5"
2670 N$(7)="BR3U1E3U2L4D1BD5BR3
2680 N$(8)="BR3BR1R2E1U1H1L2G1D1
F1H1U1E1H1U1E1R2F1D1G1F1D1BD1"
2690 N$(9)="BR3BU1F1R2E1U4H1L2G1
D1F1R3BD3"
2700 N$(0)="BR3BUFR2EU4HL2GD4E4B
D5
2710 RETURN
```

Peter Stumpf

ACORN™

COMPUTER SYSTEMS SS-50C

Color Computer



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Learning is not a gift. Learning is a habit of employing certain skills necessary to retain information. Students who appear to have an easy time mastering their studies will tell you that the secret is having good study habits (SKILLS). Time spent by students with good study habits is well used time. Many students complain that the material or subject of study was very hard to learn, even after hours of trying to learn it. On the other hand some students will report that had they no unusual complications of learning their subject even when they spent much less time at study. Spending twenty minutes to study (employing good study habits) will allow a student to follow the material and retain it better than a student (who has not developed good study habits) who has spent two hours studying.

COLOR TUTOR by JOHN WACLO is not going to give a person good study skills overnight, but it will guide a person through a subject matter in a uniform manner that will will begin to pay dividends from the very start. Using **COLOR TUTOR** is easy and repetitive. **COLOR TUTOR** provides a skeletal structure by which study material can be entered into a computer, edited, and saved on either disk or tape (depending on which version you need). I will restrict my remarks to the Disk Version, although the Tape Version is exactly the same.

Once you have inserted your **COLOR TUTOR** disk into the machine and powered up, merely type:

RUN"TUTOR"

A menu will appear on the screen as follows:

1. **TYPE NEW LESSON**
2. **LOAD LESSON FROM DISK**
3. **EDIT LESSON FROM DISK**
4. **SAVE LESSON ON DISK**
5. **STUDY LESSON**
6. **EXIT LESSON**

When selecting #1, you will be prompted with:

HOW MANY QUESTIONS DO YOU HAVE?

At this time you enter the number of questions you desire (a maximum of 50 questions are allowed for one lesson). This will be followed by:

TYPE QUESTION 1:

A question mark is automatically entered for you after each question is typed. After typing in the question, you will be asked to type in the answer to question #1. This will continue until you have typed in the pre-selected number of questions and answers. If a 16K machine is being used, restriction to 32 characters (64 on 32K machines) for each question is recommended. The program then returns to the main menu.

If a person has already entered a list of questions and answers, then selecting #2 will call that data in from the disk by asking for the:

FILENAME

Once the data has been loaded into memory, the main menu will reappear for you to make a selection.

If the need arises to change a question or answer because of a typographical error, using #3 (EDIT LESSON MATERIAL) will ask which question or answer you want to change, by number. A nice feature to this program is that when selecting #3, a password must be entered. This keeps unauthorized editing of a lesson to a minimum. Options for continuation of editing or returning to the main menu are given after each question is edited.

To save a lesson on disk, you would select #4 (SAVE LESSON ON DISK), which will ask you for a filename for the lesson to be saved. The filename selected can not be longer than 8 characters, and with the disk version a 3 character extension can be added to the filename. Pressing "ENTER" will then save the lesson on disk and return to the main menu.

Finally, when you are ready to study the lesson, selection #5 is entered. The questions will be randomized. You will be asked if you want all spelling checked? If you answer Y, then the answer must match exactly with the answer stored in memory. Selecting N will count an answer correct if the first three characters match. Upon completion of this section, you will be asked if you wish to go through the questions again; if not, you are returned to the main menu.

COLOR TUTOR is a great program for students. **COLOR TUTOR** aids in subjects like Language, Sciences, Social Studies, History, Math and Vocabulary drills. **COLOR TUTOR** can be utilized by students from the third grade all the way to college students. This program receives my grade of "A". To have the ability to recall any lesson at any time is a feature of great value to any student. **COLOR TUTOR** allows a student to save lessons that can be reviewed again later to brush-up on certain subjects before test time. **COLOR TUTOR** is flexible and versatile (well worth the money). **COLOR TUTOR** helps students begin to develop good study habits by helping them to learn how ask the right questions, and will reinforce their memory by randomly requiring the proper answer to each question. **COLOR TUTOR** requires a student to concentrate on the study material before him. **COLOR TUTOR** is truly a self-educational program. If you have a student in your family, or are yourself a student, this program is a must.

I have had a hard time using the word student throughout this review. I keep thinking about teachers. How can this program help Teachers? While this program is well done, I will be discussing the possibility of adding one more feature to **COLOR TUTOR** with John. An option to allow the questions and answers to be sent to a printer would make **COLOR TUTOR** one of the most well-rounded pieces of educational software available on the market. **COLOR TUTOR** is already powerful, versatile and useful. The inclusion of a print feature would open an additional world of potential users. Imagine what a print option could do for a teacher's lesson planning and test preparation.

Larry E. Williams

INTERNATIONAL COLOR COMPUTER CLUB.INC.

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World's Largest Color Computer Club

Dear Sir(s):

Thanks for writing.

The International Color Computer Club, Inc. was formed to help people get to know the Color Computer and how it operates, to make available to it's members all the information about the Color Computer that we can find, including information which Radio Shack isn't willing to give you. To make programs and parts available so you may extend your library and so that if your computer ever breaks, you will have the parts to repair it without waiting to go through the "Official" Radio Shack channels. The parts library is located at P.O. Box 1220, Henderson, TX.

Programming and Electronics are difficult to learn, and the club is a place you can turn to for help with problems you might have in writing a program or adapting a piece of hardware to it. We cannot solve all problems, but with hundreds of other members "worldwide" with expertise in every aspect of the Color Computer, we can solve most of them.

We also want to save our members MONEY. We receive discounts from 10% to 40% from some of the major suppliers of software and hardware for the Color Computer. In addition, we try to make available all the catalogs and program lists from the larger software suppliers, as many have lots of programs, (too many) and just can't advertise them all. You will find several of these in the new member kit.

We publish a bi-monthly newsletter larger than some "magazines" running from 56 to 80 pages on the average, in which we try to keep you up to date on all the latest events within the club, the latest items to be voted on, the newest findings on the 80-C (CoCo) and several programs which we hope you will find useful or entertaining.

New subscribers receive a new member kit, which contains a tape of programs, a tape caddy, data on the 80-C and many other goodies.

The club maintains a library of books, ROMpacks (R.S. only), and MEMBER WRITTEN programs (in Houston, TX)which you may check out (books and ROMpacks) for up to 3 weeks at a time. The programs contained in the library are FREE and do not have to be returned, however, you must send $2.00 to the library for the cost of the tape and the postage. There is six programs per tape (called packages) and are mixed in a variety for your convenience.

Members may buy/sell/trade with an ad in the newsletter, FREE! (classified style up to ¼ page). A display ad will be charged at the standard rate, less 25% to members. The only conditions for the ads are that they must not be offensive and they must be computer related.

I hope you have found this letter informative and decide to join our club. We would really like to have you. I am sure that you will find the benefits of the club worthwhile.

Thanks again for your interest.

Sincerely,

Ron Garrett
Ron Garrett
President

* Temporary until a new phone line is installed.

SOME BASIC BASICS *ABOUT DISK SYSTEMS*

Answers to BEGINNERS Questions about Disk Systems

After purchasing the computer, the next big decision facing the Computer Owner is whether or not to go into Disk Operations. CoCo owners will probably spend more on the first Disk Drive than the computer cost originally. Of course, you can put some pretty big money into Software, but even then the question looms as to whether you should get an expensive piece of software for a Cassette System with the possibility of obsoleting it if you get a Disk System. When you are first considering the purchase of a Disk System, there are a multitude of questions that need answering. This article is aimed at providing some of the answers.

You may wonder why you should even consider going to Disk. True, Tape works fine with small programs, small data files, etc. But, when you start getting into more serious applications, you are usually dealing with large, sophisticated programs which do not fit into memory. These programs can be

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PRNTDUMP

BASIC

by
Jeff Euton

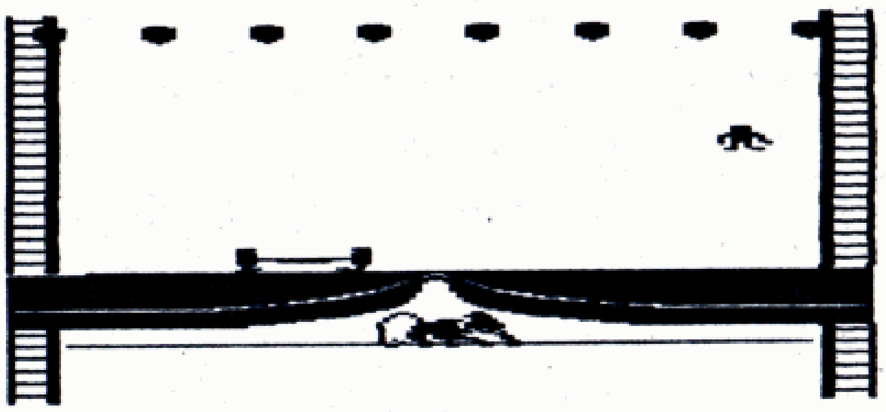
Here's a short Extended Basic Program for the CoCo that might be of interest to other CoCo fans. The routine converts **CoCo PMODE3 Graphics Memory** to serial data in a format compatible with the Integral Data Systems **IDS440 Paper Tiger Printer** for bit-mapped black & white hard copy. Since Dataproducts Corp. just acquired IDS, we should continue to see Paper Tigers around for a while.

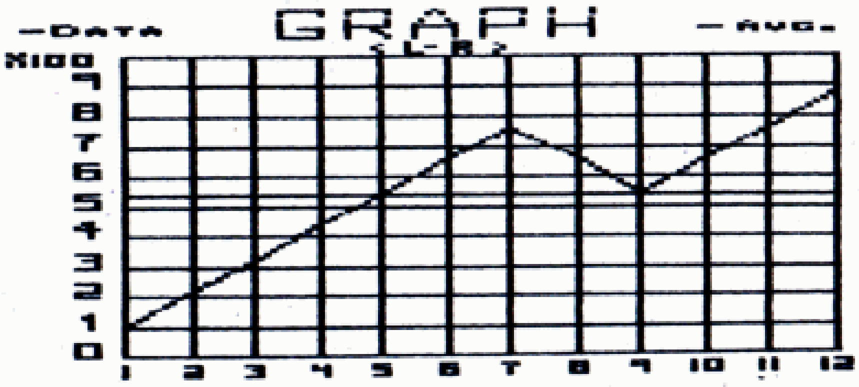
The program allows the operator to select which colors get printed as black, (and which colors get printed as white) by entry of values for each of the 4 possible colors of PMODE3 (C0-C3). For example, with a PMODE3 screen in Color Set 0, we could print yellow, red and blue as black (with the green background printed as white) by selecting C0=4, C1=1, C2=2, C3=3. The non-printing (white) color code is thus set to a value >3, while the printable (black) color code(s) are set to their associated values. There's a little more explanation in the program display while the operator is prompted for the color code entries.

Other Points Of Interest

* Line 16 - Color and Screen Statements can be changed as required
* Line 18 - serial printer bit-rate can be changed as required
* Line 30 - defaults to Disk System Graphics Page 1 starting at $0E00; this can be changed to $0600 for non-Disk Systems
* Line 65 - 'vitamin' Poke can be removed for systems that can't handle it
* Algorithm could be modified for PMODE4 by changing the horizontal screen resolution (lines 50-110) and the printer horiz resolution (lines 260-300)
* The extended basic routine is pretty slow (be patient), maybe a machine code equivalent someday...

```
2 'COCOTIGR.BAS  COCO GRAPHICS P
RINT DRIVER FOR IDS PAPER TIGER
PRINTER
3 CLS: PRINT"COCO-TIGER GRAPHICS
 PRINT DRIVER":PRINT"   COPYRIGH
T 1983 JEFF EUTON ":PRINT:PRINT"
COLOR CODES 0-3":PRINT"GRN YEL B
LU RED/BUF CYN
 MAG ORG":PRINT
4 PRINT"ENTER CORRESPONDING VALU
ES FOR COLOR CODES TO BE PRINTED
 (C0=0, C1=1, C2=2, C3=3) ELSE
  VALUE >3 FOR NON-PRINT COLORS"
6 INPUT"C0 = ";C0
8 INPUT"C1 = ";C1
10 INPUT"C2 = ";C2
12 INPUT"C3 = ";C3
16 PMODE3,1:COLOR1,2:SCREEN1,0 '
LET'S SEE WHAT WE'RE PRINTING
18 POKE 150,41 '1200 BAUD RS232
PRINTER
20 PRINT#-2,CHR$(3); ' GRAPHICS
MODE
30 M=&H0E00 'START OF GRAPHICS M
EM (WITH DISK
40 FOR V=1 TO 32 '192 VERT LINES
 OF 6 LINES/SET
50 FOR H=1 TO 32 '128 HORZ BYTES
 OF 4 DIBITS/BYTE
60 FOR DIBIT=1 TO 4 '4 DIBITS PE
R BYTE
65 POKE 65495,0 'SPEEDUP
70 IF DIBIT=1 THEN MASK=&HC0 'MS
B DIBIT
90 IF DIBIT=2 THEN MASK=&H30 'NS
B DIBIT
100 IF DIBIT=3 THEN MASK=&H0C 'N
SB DIBIT
110 IF DIBIT=4 THEN MASK=&H03 'L
SB DIBIT
120 D=0 'START WITH NULL PRINTER
 DATA BYTE
130 B=PEEK(M):B=B AND MASK 'MASK
 OUT ALL BUT CURRENT DIBIT
135 GOSUB 1000 'SELECT PRINTABLE
 COLOR(S)
140 IF P=1 THEN D=D OR 1 'SET PR
INTER DATA BIT IF REQ'D
150 B=PEEK(M+32):B=B AND MASK 'G
ET DIBIT FROM NXT VERT LINE
155 GOSUB 1000 'SELECT PRINTABLE
 COLORS
160 IF P=1 THEN D=D OR 2 'SET NX
T PRINT DATA BIT IF REQ'D
170 B=PEEK(M+64):B=B AND MASK
175 GOSUB 1000
180 IF P=1 THEN D=D OR 4
190 B=PEEK(M+96):B=B AND MASK
195 GOSUB 1000
200 IF P=1 THEN D=D OR 8
210 B=PEEK(M+128):B=B AND MASK
215 GOSUB 1000
220 IF P=1 THEN D=D OR &H10
230 B=PEEK(M+160):B=B AND MASK '
RETAIN DIBIT FROM 6TH VERT LINE
235 GOSUB 1000 'SELECT PRINTABLE
 COLOR(S)
240 IF P=1 THEN D=D OR &H20 'SET
 HI-ORDER PRINT DATA BIT IF REQ'
D
250 'NOTE THAT IDS PRINTER DOESN
'T USE 2 HI-BITS OF 8-BIT CHAR
255 POKE 65494,0 'NORMAL SPEED F
OR PRINTING
260 PRINT#-2,CHR$(D);CHR$(D); 'P
MODE 3=HALF HORIZ RESOLUTION
265 IF D=3 THEN PRINT#-2,CHR$(3)
;CHR$(3); 'DBBL ETX 'CAUSE IDS D
ROPS 1
270 NEXT DIBIT 'PROCEED TO NXT 2
 BITS OF SAME BYTE
280 M=M+1 'NEXT HORIZ BYTE OF 4
DIBITS
290 NEXT H 'NEXT MEM LOCATION
300 PRINT#-2,CHR$(3);CHR$(&HB);
'ETX,VT=PRINT GRAFX LINE
310 M=M+160 'NEXT VERT SET OF 6
LINES
320 NEXT V 'BMP MEM POINTER 6 LI
NES (32 BYTES/LINE)
330 PRINT#-2,CHR$(3);CHR$(2);CHR
$(&HC) ' EXIT GRAPHICS, FF,CR
340 STOP
1000 P=0:IF DIBIT=4 THEN IF B=C0
 OR B=C1 OR B=C2 OR B=C3 THEN P=
1
1010 IF DIBIT=3 THEN A=B/4:IF A=
C0 OR A=C1 OR A=C2 OR A=C3 THEN
P=1
1020 IF DIBIT=2 THEN A=B/16:IF A
=C0 OR A=C1 OR A=C2 OR A=C3 THEN
 P=1
1030 IF DIBIT=1 THEN A=B/64:IF A
=C0 OR A=C1 OR A=C2 OR A=C3 THEN
 P=1
1040 RETURN 'SHIFT DIBITS TO LSB
 & CHK SELECTED COLOR(S)
```





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26-3029 CoCo 2 Drive 0	$ 349.95	C. Itoh Banana Serial 50 cps	$ 249.95
26-3023 Drive 1	$ 239.95	C. Itoh Prowriter 8510 (par)	$ 399.95
Super Pro Keyboard Kit	$ 64.95	26-1268 CGP-220 Color Jet Ptr.	$ 639.95
26-3016 RS Keyboard kit	$ 34.95	26-3024 RS Multi-Pac Interface	$ 149.95

ACCESSORIES

RS D.C. Modem IB	$ 89.95	Elephant Disks ssdd	$ 22.95
Novation J-Cat Modem	$ 129.95	Verbatim Disks ssdd	$ 27.95
RS D.C. Modem II	$ 179.95	Kraft Joystick	$ 39.95
Hayes SM 300 Modem	$ 239.95	CoCo Switcher	$ 39.95
USR Password 300/1200	$ 449.95	26-3020 4 pin DIN cable	$ 5.29
Hayes/USR/Banana cables	$ 19.95	Botek ser/par Interface	$ 69.95

SOFTWARE & BOOKS

OS-9 (req. 64k)	$ 64.95	(Disk)	Color Computer Graphics	$ 5.95	
Basic-09 (req. OS-9)	$ 89.95	(Disk)	CoCo Assembly Prog.	$ 6.95	
Color Logo	$ 44.95	(Rom)	CoCo Programs	$ 9.95	
MSI Diskutil	$ 19.95	(Disk)	101 CoCo Programs	$ 9.95	
MSI Maillist	$ 24.95	(Disk)	Programming the 6809	$ 14.95	
MSI Color Finance	$ 49.95	(Disk)	Basic Faster and Better	$ 29.95	
Elite-Calc	$ 44.95	(C or D	Pooyan by Konami (32k)	$ 34.95	(C & D)
Colorcom/E	$ 49.95	(Disk)	Sea Dragon (32k)	$ 34.95	(C or D)

****

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DISK QUESTIONS

Continued from page 27

arranged so that you call only the part you need at the moment into RAM from tape or disk. With a Tape System, this takes minutes, where with Disk, it takes only seconds. The same thing is true of data storage, only more so, because data files can become much larger than the programs that generate them.

Cassette Tapes must be searched sequentially - from one end to the other. Disks are accessed randomly - the head will go to the proper place in a split second, and get or put the desired information. Also, Tapes read or write a LOT more slowly, even after the proper location is found. With Tape, you need to do a lot of manual shifting of the controls and cassettes. With Disk, most of this is automatic. And, the more sophisticated the Disk Operating System, the more automatic it is, and the more things you can do with it.

Some Questions and Answers

Let's say I have decided to buy a disk system. Do I understand correctly that I need a Controller Board and Software, as well as the Disk Drive (or Drives) to make up a Disk System?

Yes. The Controller plugs into the Cartridge Slot, and a cable goes from there out to the Drives. The Controller is normally only a Hardware item, but for the Color Computer, there is also Software in the controller; the DISK BASIC ROM.

DISK BASIC? Is that a replacement for BASIC?

No, it adds more capability to the BASIC that is already in the CoCo. You are using BASIC plus EXTENDED BASIC plus the DISK BASIC. Also, there are the Disk Commands in the DOS, or the Disk Operating System.

COLOR COPY

COLCOPY is a menu driven copy utility that copies data files or programs: disk to tape, tape to disk or disk to disk. It also kills files or programs.

Many options are provided: copies basic programs, machine language programs or data files, allows selection by groups of filenames or extensions, individual files by menu selection, writes multiple copies of files to tape, backup a disk to tape, restore a disk from tape, copies files in alphabetic sequence and much more.

Written in basic with machine language subroutines. Includes program on cassette and instructions.

Requires 32K, DOS. ONLY $15pp

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DEALER INQUIRES INVITED

Is the RS Disk Controller the only one that works with the CoCo?

Not necessarily. There are a few others being advertised, but ANY Disk Controller you use must be Color Computer COMPATIBLE. The **F & D Controller for the Color Computer** looks GOOD. They supply a PC Board with a Gold Plated edge connector, which uses a new Timing Chip that eliminates any adjustments. They can supply some of the "special" parts, but you must be able to assemble and solder Digital Electronics to use this Controller (see Dec. **CMJ** for a full Review). So far, just about anything that uses the Color Computer is using the RS Disk Controller.

I understand that the Color Computer disk drives are 35 track. Will the controller actually handle 40 tracks?

The RS (Microsoft) software is written to only support 35 Track, Single Sided Disk Drives, but the controller itself will work with 40 tracks. In fact, the controller could care less. It has NOTHING to do with how many tracks. It is the Software that determines that. We have a routine in the Data Comp FLEX(tm) Conversion that would FORMAT a Disk with 255 tracks through the RS controller **IF** there were a drive that could read and write that many.

Will the controller work with both Single and Double Density?

Again, the controller will do either single or double density; it is the Software that determines which way it is to be done. For instance, in the FLEX(tm) System conversions for the CoCo, which uses the RS controller, you can use either Single or Double Density, where the RS system, using the same controller, is strictly Double Density. The Disk **DRIVE** must be high enough **quality** to work Double Density, though.

Of course, there are still some System around that use only Single density. What is the difference between Single and Double Density?

New technology has made it possible to build Controller Chips and Disk Drive Read/Write Heads that can handle the Data faster. This allows the Data to be written more compactly on the Disk Surface, providing about 90% more Data in the same amount of Disk space.

Then, whether I wanted to use the RS Disk System, or some other Disk Drives, I would need the RS Controller board?

As of right now, yes. And, if you get a 40 track drive, you can still use it with the RS Software, **AND** have the extra tracks available for use with some of the other Disk Operating Systems, such as FLEX, which can use the 40 tracks (this ALSO applies to the Double SIDED Drives). One advantage of the CoCo is that you can step your way up to a pretty sophisticated system this way.

We're talking about 5 1/4 inch floppy disk systems. What about 8 inch?

That is a whole different ballgame. The Data transfer rate for 8" Systems is twice as fast as that of the 5 1/4" Systems. There are controllers that could handle both sizes, and possibly on the Color Computer, but now you are looking at $3000 or so and Hardware modifications to the Computer. The biggest problem is the Clock speed of the Color Computer; Radio Shack (actually, Microsoft) had to use some 'tricks' to get the Double Density on the 5 1/4" Systems (these 'tricks' cause a few problems for the CoCo OS-9, also).

How many disk drives will the RS controller handle?

It has four Drive Select lines, so it can control 4 Disk Drives. You can use four RS Drives or, with proper software, you can use one of the Drive Select Lines to select Sides on Double Sided Drives (the FLEX Conversions use the Drive 3 Select Line, since THAT line on the Color Computer Disk Controller is the Side Select line on most of the newer Disk Drives). (You can't get a RS Double Sided Drive for the Color Computer, but other Drives are available with both Double Sided and 40 or 80 Track capacities.) If you use that one Control line for Side Select, you can have only three drives, but, with two sides on each one, you get six Disk Surfaces compared to the maximum of four that is available from RS. Again, the Software determines, within limits, how to use what is available.

What other advantages are there to having Double Sided Drives?

Most people are going to need more than ONE Single Sided Drive. Rather than pay two or three hundred dollars for another Disk Drive, you can get a Double Sided Drive for about a hundred more. There is a very short BASIC Program floating around (check the Bulletin Boards and Magazines) that will make the RS DOS think your Double Sided Drive is **two** Single Sided Drives, **IF** you have **64K RAM** so that the Disk ROM can be changed.

What are some reliable names in disk drives?

The Qume Thinlines have been working very well. Tandon was good, but some problems have shown up with the later units. The Teac Drives have given very little trouble, and there are other good Drives available.

Where can I find a Controller and one of these good Drives?

Data-Comp, as well as many other Disk Drive suppliers, would be more than happy to help out in that respect.

Can you think of anything Else I should know before I rush out and plunk down my cash?

Just ASK QUESTIONS, and buy from someone with GOOD ANSWERS! If the supplier you are talking too uses the **SAME Disk Drives** in $5,000 to $20,000 Business Computer Systems, they should be good enough for the CoCo. Remember, there are **GOOD** prices, and there are **CHEAP** prices. Enough said!!

For more information, see the article by Dr. Bud Pass in the Sept. '83 issue of **Color Micro Journal** titled **"Why CoCo Can't READ"**.

Jim LaLone

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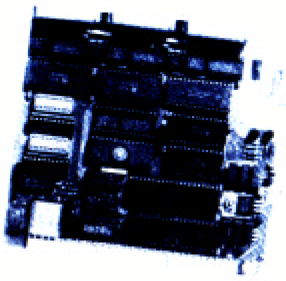
Intelligent Serial I/O Processor Board #11



The **GIMIX Intelligent Three-port RS-232C Serial Interface** can significantly increase the throughput of a multi-user system. By buffering data transfers between users and the system, and preprocessing the data, it reduces the number of interrupts to the host CPU, allowing the host more time for other processing tasks.

Features:

- Independent on-board 2MHz 6809 CPU
- Up to 20K of on-board memory (EPROM and RAM)
- Buffered data transfer between host and on-board CPUs using a Z8038 FIO with 128 byte bi-directional FIFO buffer and mailbox message capabilities
- Three RS-232C serial I/O ports (6551As) with software selectable baud rates, word length, stop bits, and parity
- Each port has five "handshake" lines for modem control applications
- The on-board 6809 can be reset by the host processor
- Compatible with memory-to-memory DMA transfers to/from the GMX 6809 CPU III
- Sense switches and status LEDs that can be used to select software options and indicate board status
- Separate 26-pin cable connections for each port

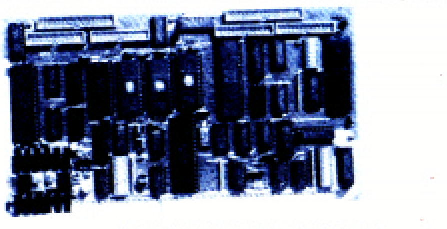
Appropriate on-board firmware and operating system drivers are required. Uses up to three #95 cable sets (DB-25S connectors).

Also available — **Intelligent five-port serial interface #13 version for the 50 pin bus.**

OS-9 firmware and drivers for the Intelligent 3-port Serial Interface

The OS-9 firmware and drivers enhance the performance of multi-user systems, while providing functions (including single character I/O) equivalent to the standard ACIA type drivers normally used for terminals and serial printers. Input line editing functions (backspace, echo, line dup and repeat, etc.) are handled by the I/O board, rather than the host, allowing the host more time for other processing tasks. The host is only interrupted when a complete input line (terminated by a "CR") is entered, or certain special characters are received. Input and output data are buffered on the I/O board so that the host can perform other tasks while serial data is being transmitted or received. When used with the GMX CPU III, block data transfers between the I/O board and the host use the CPUs memory-to-memory DMA to further enhance throughput. In addition to performance enhancements, features such as software selectable baud rates and transmission characteristics (number of data bits, stop bits, parity etc.) are provided. The board also transmits "messages" to any or all I/O ports to indicate that the I/O Interface is ready and "waiting for the host", and that the host is "on-line" and has opened a path to the port. Messages to individual ports can be disabled.

Intelligent Parallel I/O Processor Board #12



The **Intelligent Four-port Parallel Interface** can be used to improve system performance by buffering data transfers to parallel peripherals such as printers and/or by buffering and pre-processing parallel input data from keyboards, sensors, etc.

Features:

- Independent on-board 2MHz 6809 CPU
- Up to 32K of on-board memory (EPROM and RAM)
- Buffered data transfer between host and on-board CPUs using a Z8038 FIO with 128 byte bi-directional FIFO buffer and mailbox message capabilities
- Four fully buffered 8-bit parallel ports with handshaking and input/output latches (two 6522 VIAs). Each 6522 also has two 16-bit counter/timers and a shift register for serial data transfers
- Software programmable direction for each bit on two of the four ports (1 per VIA), the other 2 ports can be individually programmed as 8 in or 8 out. The bi-directional handshake lines can be programmed as inputs or outputs
- The on-board 6809 can be reset by the host processor
- Full 20-bit address decoding; it can be addressed on any 4 byte boundary in 1M byte of address space
- Compatible with memory-to-memory DMA transfers to/from the GMX 6809 CPU III
- Sense switch and status LEDs that can be used to select software options and indicate board status
- Separate 26-pin cable connections for each port plus two 36-pin, Centronics pinout compatible, connectors. Each 36 pin connector uses 2 ports to allow full implementation of the Centronics printer interface

Appropriate on-board firmware and operating system drivers are required. Uses up to four #95 cable sets (DB-25P connection) or two 36-pin cable sets with Centronics compatible connection. Centronics compatible cable sets include a back panel connector plate for the Classy Chassis. Back panel to printer cables are also available.

GIMIX 2MHz Input/Output Boards

Serial Interface Boards

SERIAL INTERFACE boards use the versatile 6850 programmable ACIA that provides software control over number of data bits, parity, stop bits, and interrupts. They all feature RS-232 compatible input/output with RTS, CTS, and DCD handshake signals.

All serial boards have gold plated header type connectors for corrosion resistance and reliable operation.

2 Port Serial Interface #43

Solderless jumpers provide easy selection and changing of options.

(for the 30 pin bus)

Features:

- 2 separate RS-232 ports (with handshake) on a single board
- Jumper programmable connector pinouts for easier connection to external devices (Connector can be programmed as DCE or DTE)
- Provides direct plug in of standard RS-232 connectors when used with optional GIMIX cable sets
- Individual baud rate and interrupt select jumpers for each port
- Selectable for use with 4, 8 or 16 addresses per slot

Uses 1 or 2 #95 cable sets.

8 Port Serial Board #46

The GIMIX 8 PORT SERIAL INTERFACE has 3 header type connectors for external connections. The center connector provides Transmit Data, Receive Data, and signal ground for all 8 ports. The outer 2 connectors each provide TX, RX, and signal ground as well as the 3 handshake lines RTS, DCD, and CTS for 4 ports.

(for the 50 pin bus)

Features:

- 8 separate RS-232 ports (with handshake) on a single 50 pin board
- Extended address decoding for the SS50C bus
- Occupies only 16 bytes of address space
- DIP-switch addressable to any 16 byte boundary
- Individual DIP-switch selectable baud rates and interrupts for each port
- On board baud rate generator for baud rates from 75 to 38.4K baud

Uses 1 or 2 #95 cable sets.

Single Port Serial Interface #41

(for the 30 pin bus)

DIP-switches provide full control over I/O and handshaking configuration — easily accessible, no soldering necessary for:

- RS-232 or 20 Ma. Current Loop select
- One of five baud rates or an external clock
- Optional connection to the Interrupt Request line
- Override of the DCD and CTS modem control signals

On-card regulators for +5, +12, and −12 volts provide power at the connector for modems, cassette interfaces, etc.

Uses 1 or 2 #95 cable sets.

#95 Cable Sets For I/O Boards

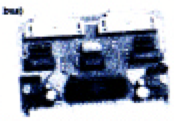
Cable sets include: Ribbon cable with a matching connector for the I/O board, a 25 pin "D" type data connector for back panel mounting, and mounting hardware. Please specify which board when ordering cable sets.

Parallel Interface Boards

Parallel boards use the 6821 PIA for compatibility and versatility. Each 6821 provides two 8 bit ports with a variety of handshake and interrupt generation modes.

Two Port Parallel Interface Card #42

(for the 30 pin bus)



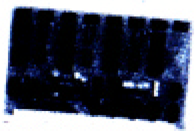
Each Port Has:

- Eight data I/O lines — fully **buffered**, with Schmitt-trigger inputs for high noise immunity
- DIP-switch selection, of either input or output
- One **buffered** input handshaking line
- One **buffered** output handshaking line that is strappable for input
- DIP-switches for connecting to the Interrupt Request or the Non-Maskable Interrupt lines
- A gold-plated header connector • Gold Bus Connectors
- A DIP-socket for connecting to boards that need an external 8-bit or output port such as the GIMIX Opto board
- On-card regulators for +5 and −12 volts provide power at the connectors for keyboards, tape readers, etc.

Uses 1 or 2 #95 cable sets.

8 Port Parallel Interface Board #45

(for the 50 pin bus)



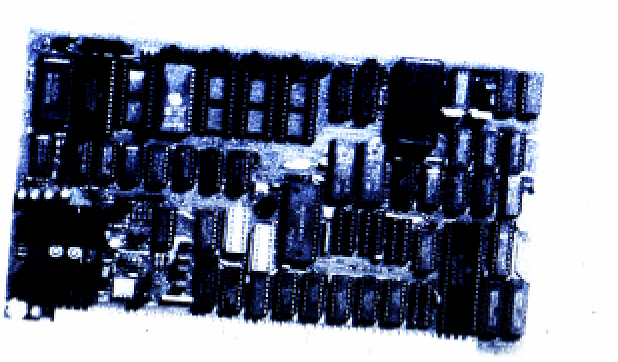
- Eight 8 bit parallel ports on a single board
- Four 6821 PIAs
- 3 ports buffered for output
- 5 ports bi-directional (not buffered)
- Built in interrupt generator outputs 1 second or 1 minute interrupts
- Occupies 16 bytes of address space
- DIP-switch addressable to any 16 byte boundary
- Does NOT have extended address decoding

Uses 1 to 8 #95 cable sets.

GIMIX 6809 CPU PLUS Board #05 for use with FLEX, OS-9 GMX I, UniFLEX, and OS-9 GMX II

The GIMIX 6809 PLUS CPU is an extremely versatile board that offers the user a great many features and options which make it an ideal choice for a variety of systems and applications.

- Any one of 3 memory management techniques can be used: Straight Bank Select, GIMIX Enhanced DAT with software write protect (optional), SWTPC compatible DAT (required for SBUG-E) (optional)
- Software write protect in 4K blocks of the entire address space (when GIMIX enhanced DAT is installed)
- Jumper selectable processor clock speeds (1, 1.5, 2 MHz)
- Separate buffers for the 6809 and the on card devices
- 4 PROM/ROM/RAM sockets for monitor and user software (up to 32K)
- PROM/ROM/RAM sockets individually jumper selectable for single or multiple supply voltage and 1, 2, 4 or 8K byte devices (Some FPLAs do not support 8K devices.)
- 1K bytes of scratchpad RAM
- 6840 programmable timer with provisions for external clock, gate and output connections
- Time of Day Clock (58167) w/ Battery backup
- 9511A or 9512 Arithmetic Processor w/Jumper selectable 2, 3, or 4 MHz clock speeds (optional)
- FPLA address decoding for the 8 on card devices: 4 PROM/ROM/RAM sockets, 58167, 9511A/9512, 6840, 1K scratch pad RAM
- Software switching of address configurations for the 8 on card devices (allows software switching between on board PROM/ROM/RAM resident system monitors)
- All FPLA decoded devices can be individually enabled/disabled
- FPLA decoded devices are available for DMA access
- Extended addressing for the FPLA decoded devices (can be disabled)
- Software switching between on and off board system monitors using extended addressing
- Jumper selectable interrupts for the 6840, 58167, and 9511A/9512
- NMI input can be jumpered to the bus or to an external connector
- BA & BS jumper selectable for independent or gated operation
- User defined latch output
- Gold Molex connectors for trouble free contact
- SS-50 and SS-50C compatible
- Full DMA capabilities (works with any of the 6809 DMA methods)
- Full Slow memory capabilities
- Fully assembled, tested and burned in



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The GIMIX CLASSY CHASSIS 6800/6809 SS-50 Bus Mainframe

The CLASSY CHASSIS includes:

A heavyweight, aluminum cabinet (18" wide x 21" deep x 7" high) painted in a putty colored, durable baked enamel finish. The cabinet holds our 6800/6809 mother board, CV Ferro-resonant power supply and has provisions for mounting one or two 5¼" Floppy or Winchester disk drives. The back panel is punched for 15 "D" type data connectors (25 pin) and has provisions for two removable connector plates that are available in a variety of connector configurations. Cabinets are normally supplied with two blank plates unless other types are required or specified. The cabinet includes a fan and ventilation slots which direct cooling air over the boards and power supply. The front panel has a 3 position, key locking, power switch that permits the reset switch to be locked out, preventing accidental system reset, and a three position Reset/Abort switch. Optional filler plates are available for systems that do not use the 5¼" drive openings.

The 6800/6809 SS-50/C Motherboard

This highly versatile motherboard is easily reconfigured for a variety of 6800 and 6809, SS-50 and SS-50C bus configurations.

Gold Plated connectors are used throughout to insure long lasting electrical contact and protection against corrosion.

It has fifteen 50 pin slots, 8 DIP-switch addressable 30 pin I/O slots, and a special 10 pin slot for the baud rate generator board. The fully buffered I/O block can be configured for 4, 8, or 16 decoded addresses per slot, and is DIP-switch addressable to any 32, 64, or 128 byte boundary. Extended address decoding (SS-50C) allows the I/O block to be addressed anywhere in the 1M byte address space.

The baud rate generator board provides 11 standard (16X) baud rates, from 75 to 38.4K, in 2 groups. Programming jumpers allow easy selection of up to five baud rates. The five baud rate lines on the 50 pin bus are easily disconnected from the 30 pin bus for use with SS-50C extended addressing or as user defined lines. A slow I/O circuit, for the 6809 CPU, can be used to generate an MRDY signal whenever an I/O slot is accessed (this allows, for example, using PIO Disk Controllers with a 2MHz 6809 CPU).

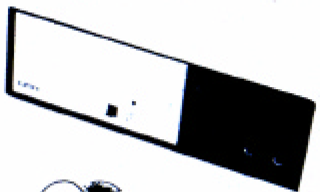
All data, address, and control lines are fully terminated and separated by noise reducing ground lines on the bottom of the board.

The .093" thick, double sided PC board has a full ground plane Faraday Shield on the top side to further reduce noise.

Industrial Quality Power Supply

Features:

A Constant Voltage, Ferro-resonant, Faraday shielded, transformer custom designed for GIMIX, for brown-out and overvoltage protection and for proper system operation, even under adverse AC power input conditions. It includes an AC line filter, 3 DC filter capacitors, and a filter assembly board with clamping terminal block for easy wiring. The power supply provides +8 Volts at 30 Amps, +16 Volts at 5 Amps, and −16 Volts at 5 Amps, enough to power a fully loaded system plus the 5¼" disk drives (floppy and/or Winchester) that can be installed in the cabinet. All outputs are filtered and individually fused. The standard version operates over an AC input range of 90 to 140 Volts, 60 Hz. Export versions are available for inputs of 95 to 130 or 190 to 260 volts, 50 Hz.



GIMIX 6809 systems
support five predominant
operating systems:

OS-9 GMX III,
OS-9 GMX II,
UniFLEX,
OS-9 GMX I,
FLEX

and a wide variety of languages
and development software.

Whatever your application: software development, instrumentation, process control, educational, scientific or business, whether you need single or multi-user capabilities, GIMIX has hardware and the operating systems to get the job done reliably.

Please phone or write if you need further information.

The GMX 6809 CPU III

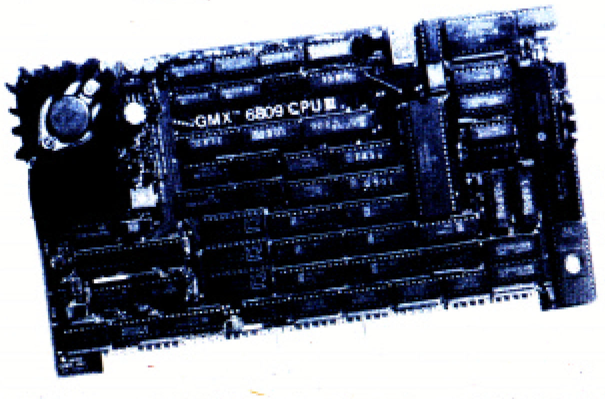
The GIMIX 6809 CPU III board is an advanced design specifically intended for use with multi-user multi-tasking operating systems.

Built on a multi-layer circuit board and utilizing high-speed, high-density logic, the GMX CPU III enhances the performance of the 2MHz 6809 by providing such features as: 1 byte/microsecond DMA block transfers from memory to memory or between memory and I/O devices, and advanced memory management with 2K segments and segment attributes. The board automatically arbitrates DMA contention between the on board DMA and external DMA devices such as disk controllers. The 2K memory segments allow more efficient memory usage. The segment attributes allow the trapping of out-of-range memory references, write protection, and a hardware single step function for software debugging.

The board prevents the execution of certain illegal instructions from crashing the system by monitoring interrupts to the 6809 and its response to them. If the processor does not respond to an interrupt within 128 clock cycles the board resets the 6809 and asserts a special reset vector. The system can then close down the offending task and resume normal operation. This also limits the length of time that interrupts can remain masked by a user, preventing users from keeping the system from task switching and servicing other users.

To further protect the system, the CPU board supports separate user and system "states" with automatic switching to the system state in response to interrupts and system (SWI) calls. Certain functions and memory areas can only be accessed in the system state, preventing unauthorized accesses.

The GMX CPU III also includes a full function time-of-day clock with year and automatic leap year/daylight savings time correction, and a 2K scratchpad RAM, both with battery back up. To provide precision timing functions, a 6840 PTM with a separate 500 KHz precision (.0025%) time base oscillator is included. The oscillator is easily user replaceable to provide other time base frequencies (750 KHz maximum.) The single EPROM socket will accept 2K, 4K or 8K EPROMS, with a maximum of 4K mapped into the system address space at any one time. Software switching is implemented by selecting the upper or lower half of an 8K EPROM under hardware or software control.



OS-9 GMX III Operating System

OS-9 GMX III is an enhanced OS-9 Level II that takes full advantage of the features of the GMX CPU III. As a result, the system is faster, more memory efficient, and a more secure multi-user, multi-tasking operating system than the original OS-9 GMX II, while retaining complete software compatibility. Throughput is enhanced by the memory to memory DMA and the automatic task switching, while the memory attributes and illegal instruction trapping protect the system and individual users from each other. Sharable system modules in RAM are write protected to prevent tampering. Memory mapping in 2K segments and the ability to load modules in non-contiguous RAM provide more efficient memory utilization. Each task can be allocated a full 64K of RAM, with no operating system overhead in the task's address space.

UniFLEX for the GMX 6809 CPU III and Intelligent I/O boards is in development.

Non-Volatile 64KB CMOS STATIC RAM Boards with Battery Back-up #64

All GIMIX boards have Gold Bus Connectors and are fully socketed, assembled, burned in, and tested.

Features:

- Addressable in two 32K sections with separate regular and extended address decoding for each section. Each section can be addressed to any 32K boundary in the address range (1M byte with extended addressing). Each 32K section is divided into four 8K blocks that can be individually enabled or disabled. Disabled sections do not occupy address space.
- Fully Static Memory does not require complicated refresh timing or clocks for data retention. Compatible with any of the 6800/6809 DMA techniques
- Guaranteed 2MHz Operation uses high speed (150 Ns.) memory with no wait states or clock stretching required
- Non-Volatile Memory with built in battery back-up. Retains data even with system power removed. With the battery fully charged, data remains intact for a minimum of 21 days
- Ultra-Low Power CMOS RAM requires less than ¼ AMP (250 Ma.) typical at 8V
- Low Bus Voltage Detection inhibits memory access during power up and power down to prevent false writes to the memory
- Write Protect Switch permits the entire board to be write protected for PROM/ROM emulation and software debugging

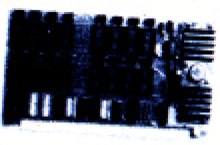
ALSO AVAILABLE
NMOS Version
Without
Battery
Backup #67

- Low Power NMOS RAM requires less than ½ AMP (500 Ma.) typical at 8V
- Write Protect optional with customer supplied switch or jumper

Windrush EPROM Programmer

- Probably the most versatile EPROM Programmer available. Interface & software to EXORciser - II (fully addressable) and S-50 bus systems
- Programs and verifies 2508/2708, 2516/2716 (single and tri-volt types), 2532, 2732, 2732A, 2564, 2764 — without additional 'personality' modules
- Programmer extends out to your work area via 5' of twisted pair cable
- Extensive commands menu: move data, read, program, verify EPROMs, examine/change buffer, formatted dump of buffer, fill buffer
- Fully documented user's manual w/schematics & theory of operation. Professionally finished PCBs w/solder resist & component overlay
- Software available for FLEX 2/9, SSB, OS-9 (LVL 1 now, LVL 2 later) and MDOS. All source files supplied. One version is supplied FREE. Specify disk size please.

16 Socket EPROM/ROM/RAM Board #32



Features:

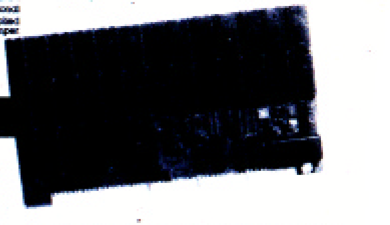
Up to 128K on a single board (using 8K devices).
Can be used with 2, 4, and 8K 24 pin, 2716/2516 pinout, single supply voltage EPROMs and most pin-compatible ROMs and static RAMs.

- Device sizes and types can be mixed on the same board
- 2 separate 8 socket sections
- DIP-switch selection of base address for each section
- Individual address decoders for each section, including extended address decoding
- Bi-polar PROMs for address decoding allow mixing of device sizes within a section
- Separate slow memory generation for each section (6809 only)
- Each socket is jumper programmable for device size and type (2, 4 or 8K PROM/ROM/RAM)

256K Byte STATIC RAM Board #63

Features:

- Addressable in configurations to suit a variety of applications. Full 20 bit address decoding for 1M byte systems. Addressing compatible with OS-9 GMX II and III, UniFLEX and FLEX with GIMIX VDISK
- Fully Static Memory does not require complicated refresh timing or clocks for data retention. Compatible with any DMA technique
- Guaranteed 2 MHz. Operation uses high speed (150ns), 8Kx8 static RAMs with no wait states or clock stretching required
- Low Power RAM requires less than 350 ma. typical at 8V for 256K Bytes. A Megabyte (4 boards) requires less than 1.5 Amps.



256K Byte Non-Volatile, Battery Backup Version (as pictured) #72

With the same features as the above PLUS:

- NiCad Battery Backup for power-off data retention up to 300 Hrs. with a fully charged battery
- Low Bus Voltage Detection inhibits memory access during power-up and power-down to prevent false writes to the memory
- Write Protectable for PROM/ROM emulation and software debugging

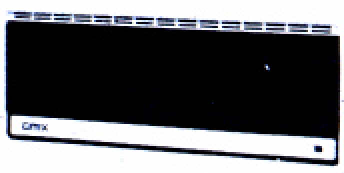
8" Disk Cabinet and Power Supply

The cabinet features the same quality styling, and finish as the GIMIX MAINFRAME and mounts two standard size 8" floppy and/or winchester disk drives. It will also hold 4 thinline 8" floppies or a combination of 1 thinline floppy and an 8" winchester.

To provide an easy means of controlling the power to an entire system from one switch, three accessory outlets, one for the computer and two for peripherals (terminals, printer, etc.), are provided. The back panel mounted power switch selects either OFF, ON, or the AUTO mode. In the AUTO mode, the power supply and two of the accessory outlets are controlled by the computer (or other device) connected to the third accessory outlet. When the computer is turned on or off, the cabinet senses the presence or absence of current flow to the computer and turns itself and the other accessory outlets on or off. Circuitry is also provided to turn AC drive motors ON and OFF under computer control. A built in fan with a washable air filter provides cooling for the power supply and drives. The back panel is punched for 4 connectors (two 50 and two 20 pin) for connections between the cabinet and the computer.

The power supply uses a constant voltage Ferro-resonant transformer for reliability and protection against brownouts and power line noise. It provides +5 Volts at 6 Amps, +24 Volts at 6 Amps and −5 Volts at 750 Ma. continuously, with ample surge capacity for drives that require higher starting currents. The supply has two separate 24 V outputs that can be sequenced to delay starting of the second drive until the first is up to speed.

All units are fully assembled, burned in, and tested.



Winchester Systems

Winchester packages are available for upgrading current GIMIX 6809 systems equipped with #68 DMA controllers and at least one floppy disk drive. The packages include one or two Winchester drives, DMA Hard Disk Interface, and the appropriate software drivers. The interface can handle two Winchester Drives and provides Automatic Data Error Detection and Correction: up to 32 bit burst error detection and 11 bit burst error correction.

Dual drives can be used together to increase on line storage — or use one for back-up of the other. (More convenient and reliable than tape backup systems.)

GIMIX 30 and 50 Pin Prototyping Boards

- Double sided with plated thru holes and gridded power and ground lines. • The entire top edge has pads for .100 x .100 header (ribbon) connectors. • Provisions for decoupling caps distributed throughout the array. • Can be used with wire wrap, wiring pencil, solder wiring, etc. • With gold bus connectors and heat sinks – unassembled.

GIMIX 50 Pin Prototyping Board #44

- 16 rows of pads on .100 x .300 centers; up to 72 fourteen pin ICs. • Accepts standard 6, 8, 14, 16, 20, 24, 28, and 40 pin DIP devices. • Accepts 4 TO-220 regulators: 2 on the +8V & 1 ea. on the +/− 16V lines.

GIMIX 30 Pin Prototyping Board #33

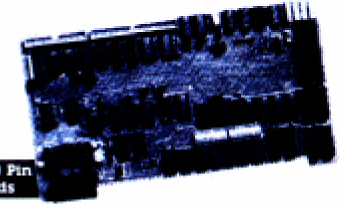
- 8 rows of pads on .100 x .300 centers; up to 41 fourteen pin ICs. • Accepts standard 6, 8, 14, 16, 20, 24, and 40 pin DIP devices. • Accepts 3 TO-220 regulators: 1 on the +8V & 1 ea. on the +/− 16V lines.

GIMIX DMA Double Density Disk Controller #68

The GIMIX DMA (Direct Memory Access) DISK CONTROLLER has the capabilities needed to realize the full potential of today's sophisticated multi-user/multi-tasking operating systems such as OS-9™ and UniFLEX™.

High speed using bi-polar logic DMA circuitry for guaranteed operation at 2MHz. DMA transfers take place at full bus speed using 6809 cycle steal DMA. Interrupts can be generated to indicate the completion of the transfer.

3 ms. **stepping** is supported on 5¼" as well as 8" drives.



Single and Double Density data storage on any combination of 5¼" and 8" floppy disk drives, single and double headed, single and double track density up to 4 drives total.

Low Error Rates are insured by a data recovery circuit (data separator) and adjustable write precompensation circuitry for drives that require precomp. Separate precomp adjustments are provided for 5¼" and 8" drives.

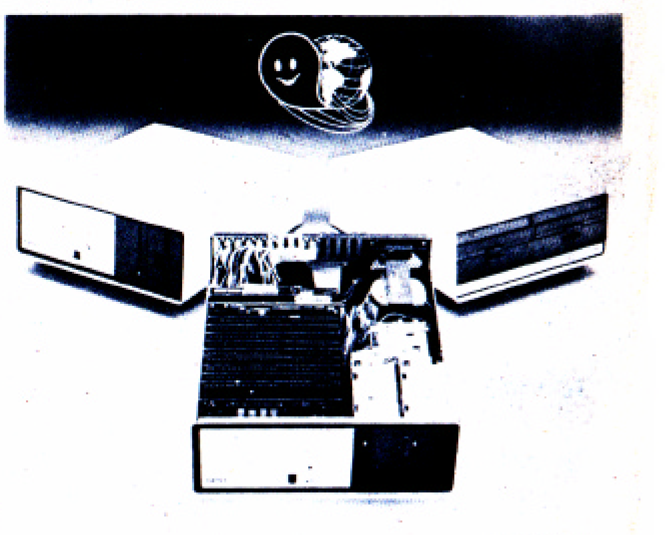
Addressable to any 8 byte boundary in the address space (1M byte when extended address decoding is used). The board occupies only 8 bytes of address space.

Extended Addressing control using the SS-50C extended address lines. Control of the extended address lines allows the board to perform DMA transfers to and from any address in the 1M byte address space.

Fully Buffered with separate 5¼" and 8" output buffers and schmidt trigger input buffers for the disk drive signals.

The DMA controller leaves the processor free to perform other tasks once the transfer is initiated, unlike programmed I/O disk controllers which require full time use of the processor during data transfers to and from disk.

This is extremely important in a multi-user/multi-tasking environment as the processor can perform other tasks such as console I/O while a disk transfer is in progress.



GIMIX inc.

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TWX 910-221-4055

GIMIX 2MHZ 6809 SYSTEMS CAN BE CONFIGURED TO RUN:
FLEX ★ OS-9 LEVEL ONE ★ UNIFLEX ★ OS-9 LEVEL TWO

SINGLE USER SYSTEMS with 56KB of static RAM
MULTI USER SYSTEMS with 128-512KB of static RAM and up
YOUR GIMIX SYSTEM CAN GROW WITH YOUR NEEDS

CHOOSE FROM GIMIX 5¼" OR 8" FLOPPY DISK DRIVE
SYSTEMS AND WINCHESTER DRIVE SYSTEMS